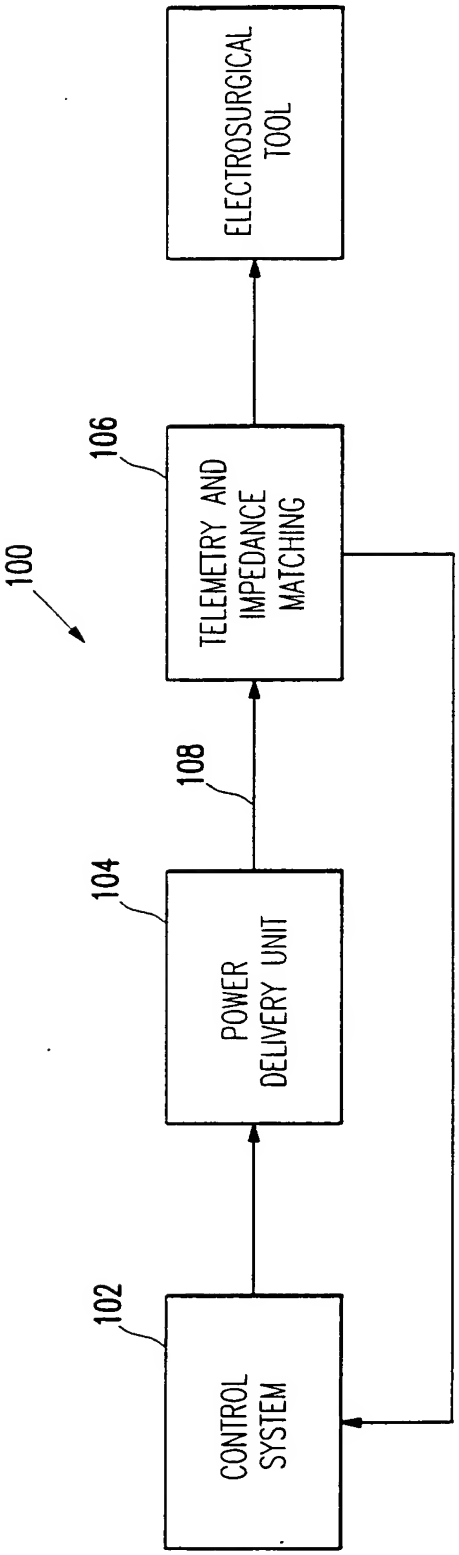

ELECTROSURGICAL TOOL
106
TELEMETRY AND IMPEDANCE MATCHING
100
108
104
POWER DELIVERY UNIT
102
CONTROL SYSTEM

FIG. 1

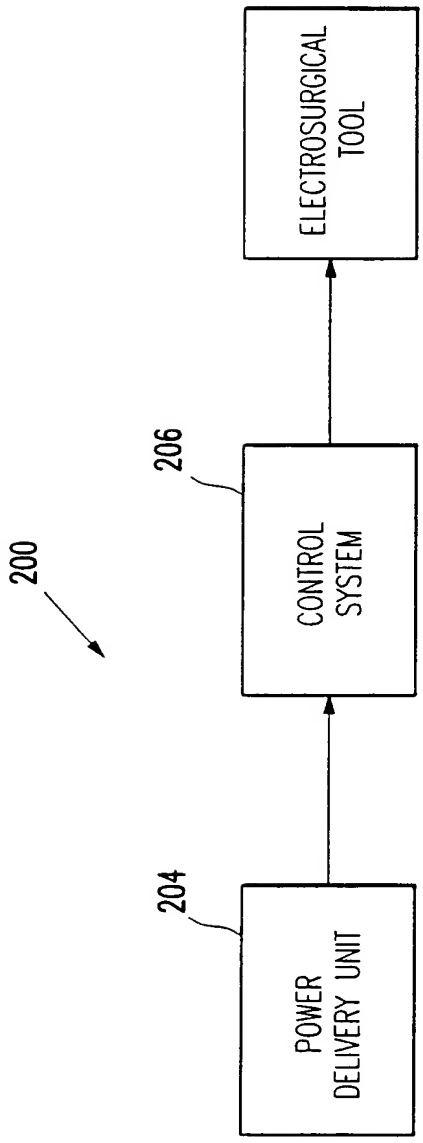

200
204
POWER DELIVERY UNIT
206
CONTROL SYSTEM
ELECTROSURGICAL TOOL

FIG. 2

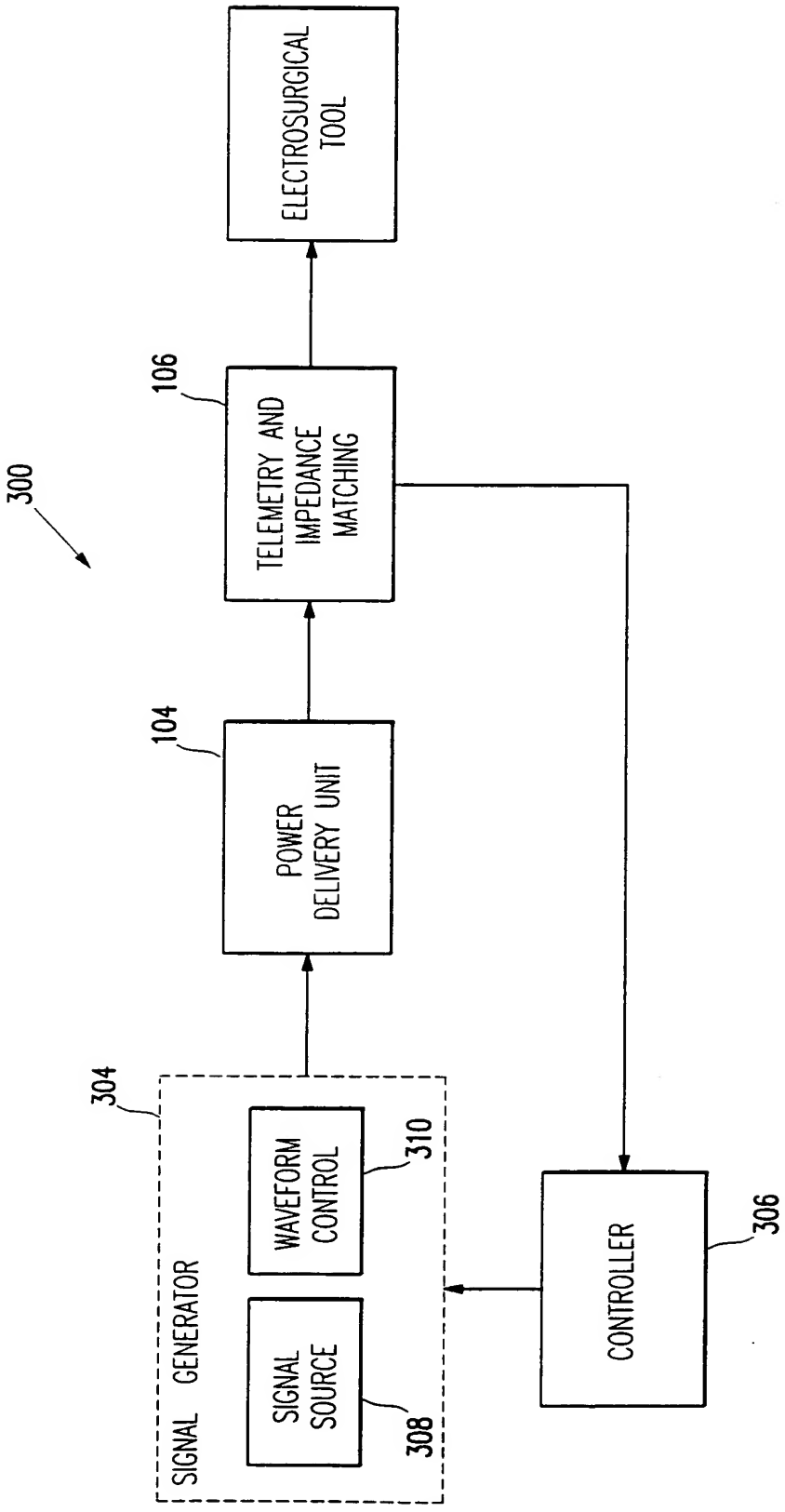

300
ELECTROSURGICAL TOOL
106
TELEMETRY AND IMPEDANCE MATCHING
104
POWER DELIVERY UNIT
304
SIGNAL GENERATOR
WAVEFORM CONTROL
310
SIGNAL SOURCE
308
CONTROLLER
306

FIG. 3

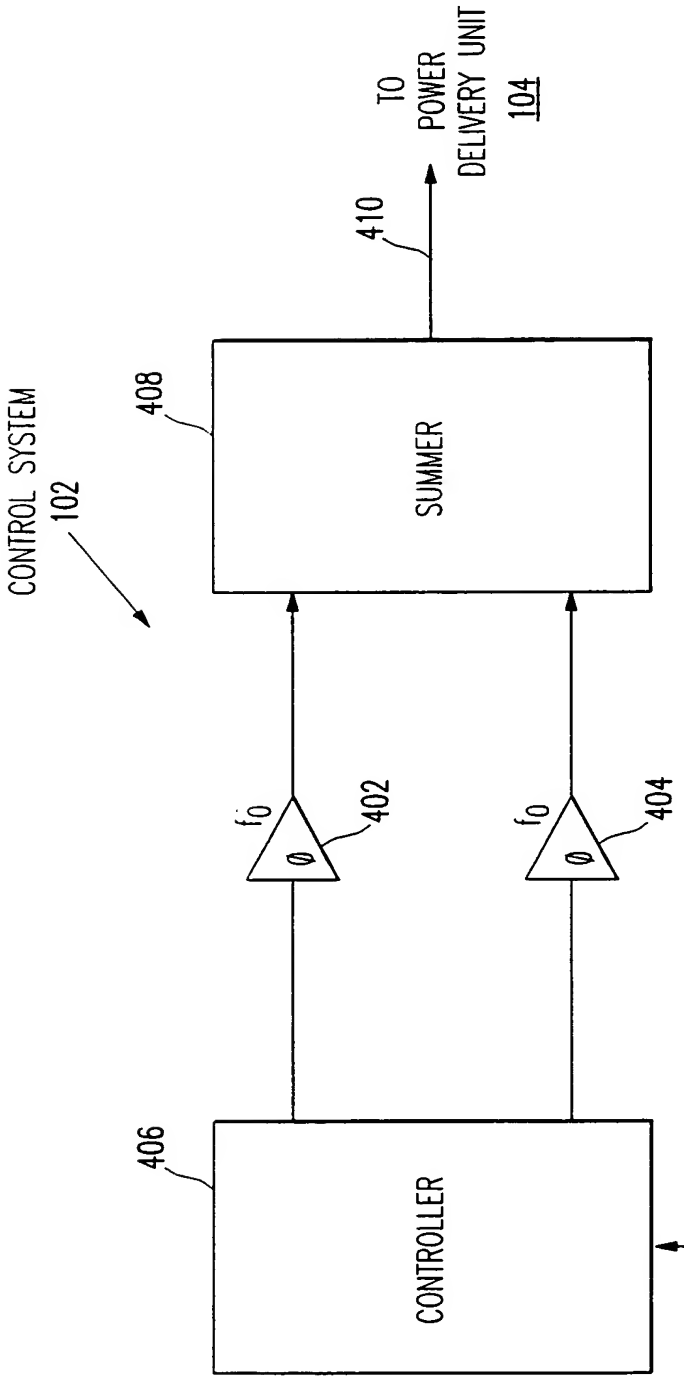

CONTROL SYSTEM
102
408
SUMMER
410
TO
POWER
DELIVERY UNIT
104
f_0
0
402
f_0
0
404
406
CONTROLLER
FROM
TELEMETRY AND
IMPEDANCE
MATCH

FIG. 4

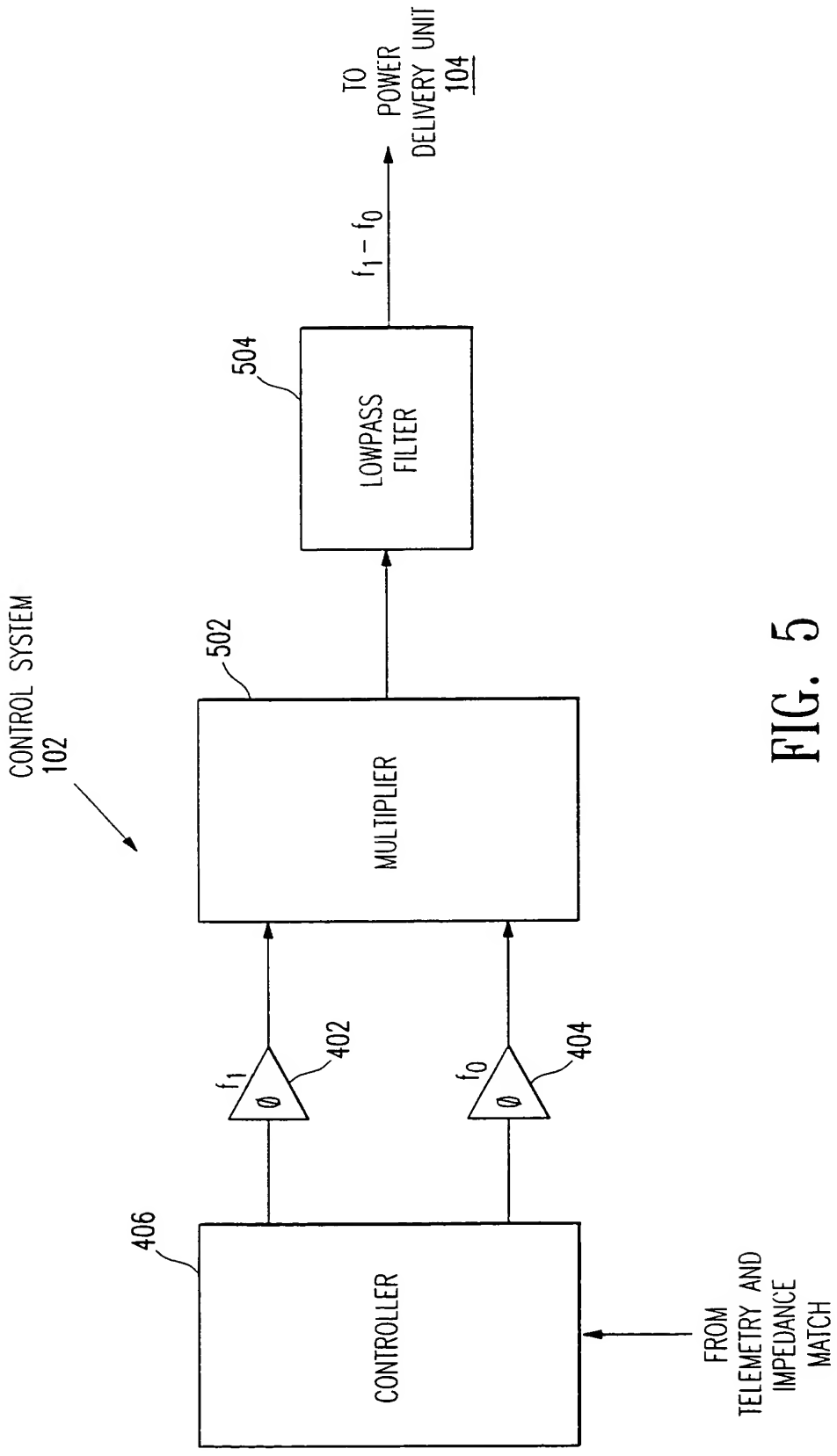

CONTROL SYSTEM
102
CONTROLLER
406
FROM TELEMETRY AND IMPEDANCE MATCH
f_1
ϕ
402
f_0
ϕ
404
MULTIPLIER
502
LOWPASS FILTER
504
$f_1 - f_0$
TO POWER DELIVERY UNIT
104

FIG. 5

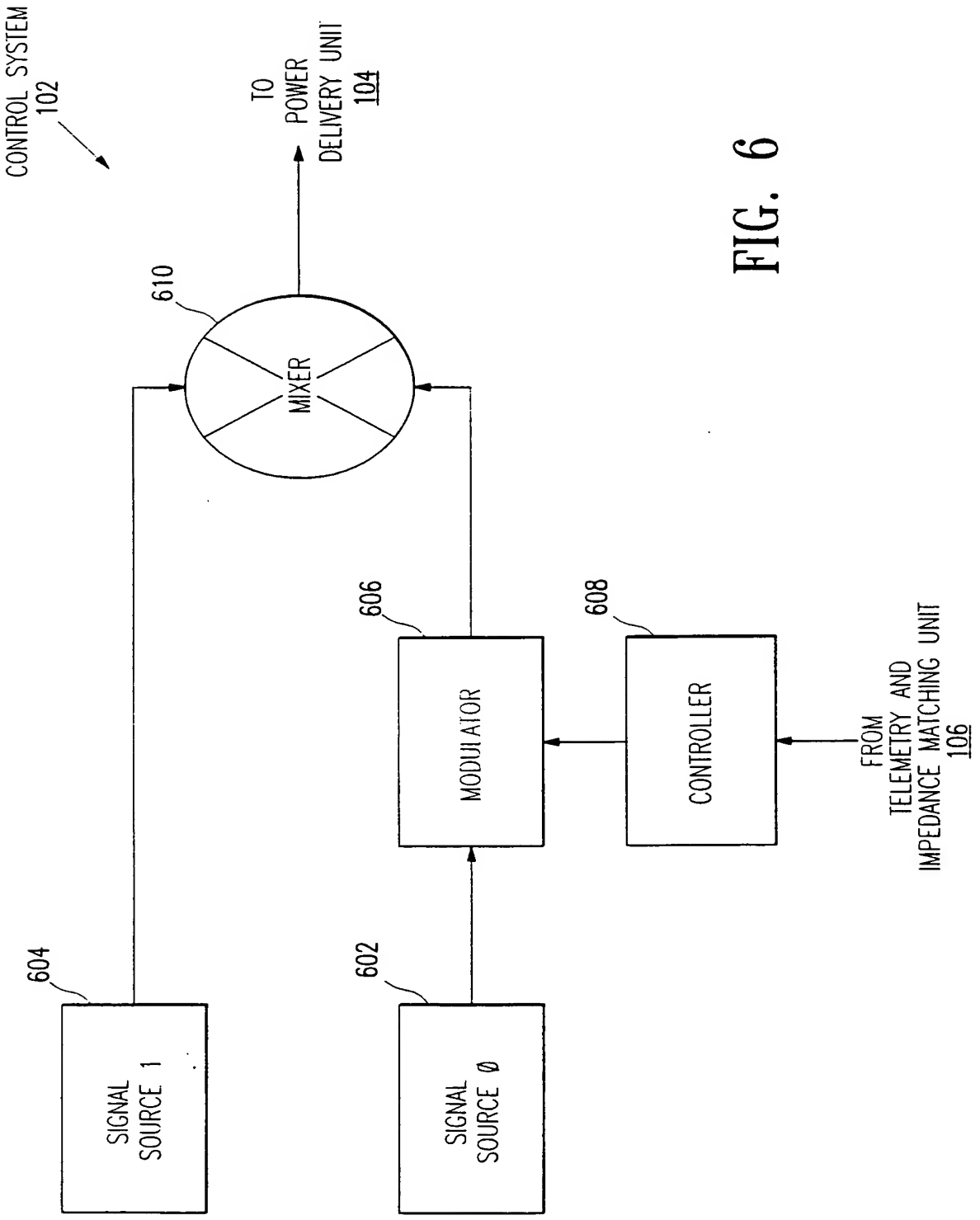

CONTROL SYSTEM
102
TO
POWER
DELIVERY UNIT
104
610
MIXER
606
MODULATOR
608
CONTROLLER
FROM
TELEMETRY AND
IMPEDANCE MATCHING UNIT
106
604
SIGNAL
SOURCE 1
602
SIGNAL
SOURCE Ø

FIG. 6

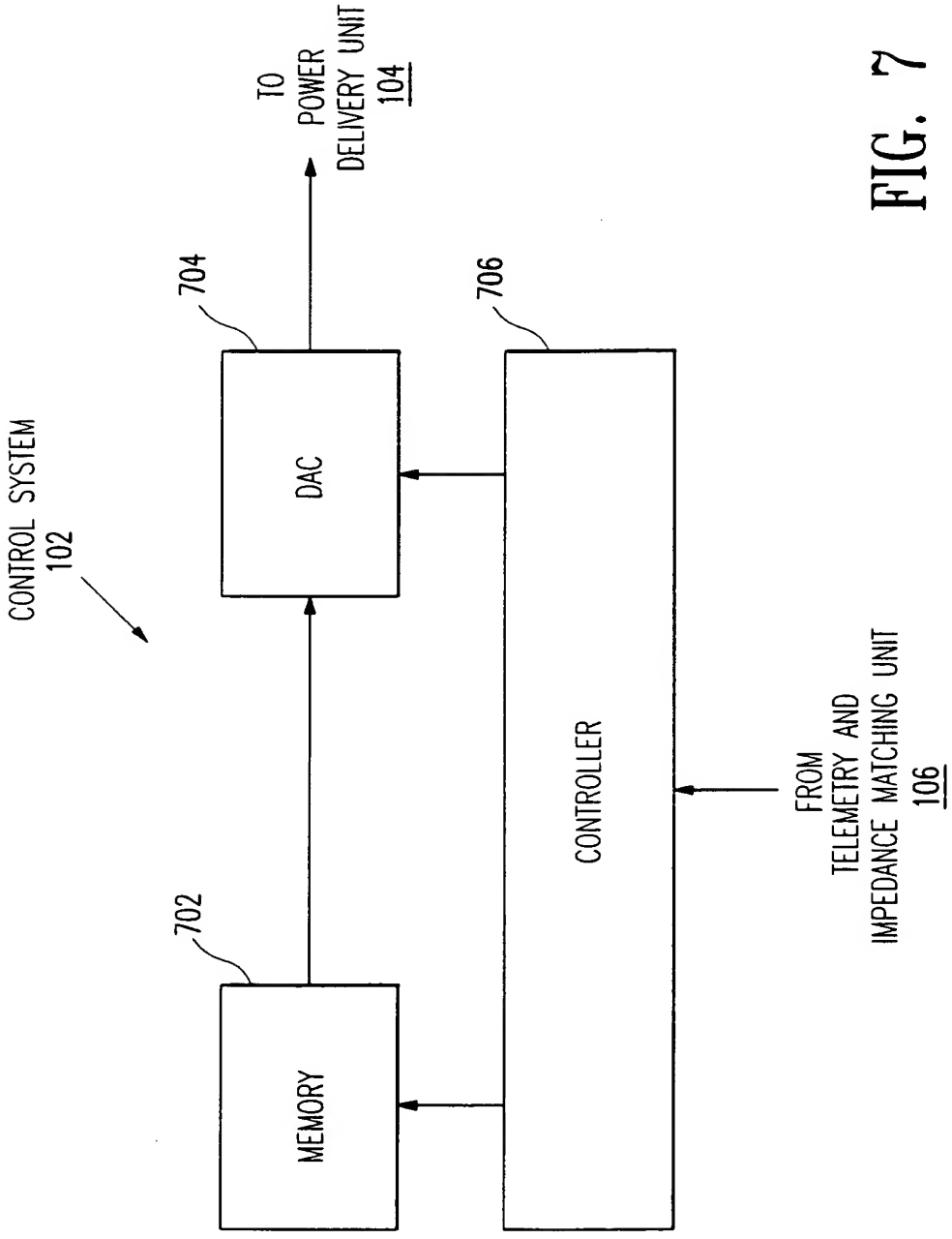

CONTROL SYSTEM
102
TO
POWER
DELIVERY UNIT
104
704
706
DAC
CONTROLLER
MEMORY
702
FROM
TELEMETRY AND
IMPEDANCE MATCHING UNIT
106

FIG. 7

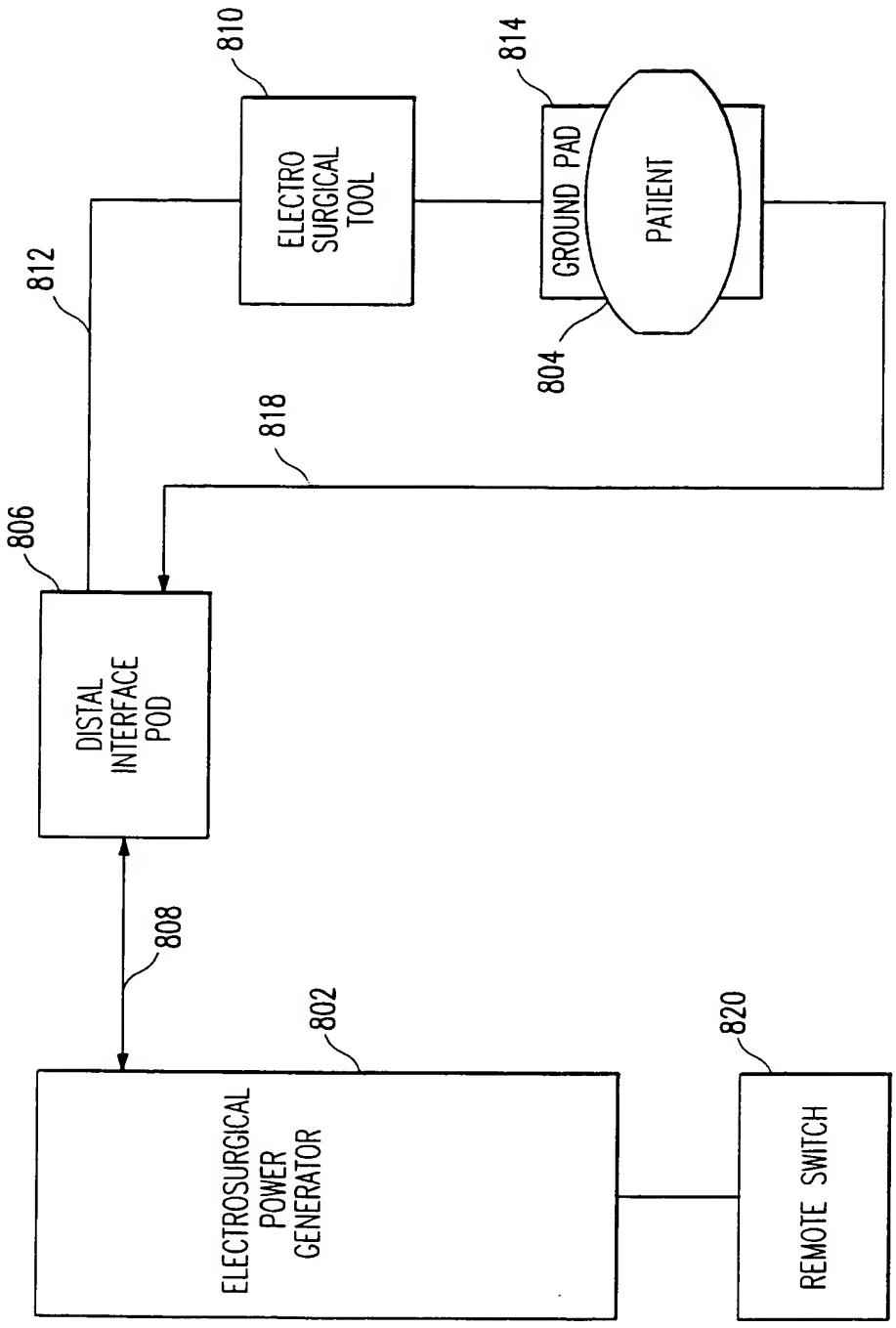

810
814
ELECTRO SURGICAL TOOL
GROUND PAD
PATIENT
812
804
818
806
DISTAL INTERFACE POD
808
802
820
ELECTROSURGICAL POWER GENERATOR
REMOTE SWITCH

FIG. 8

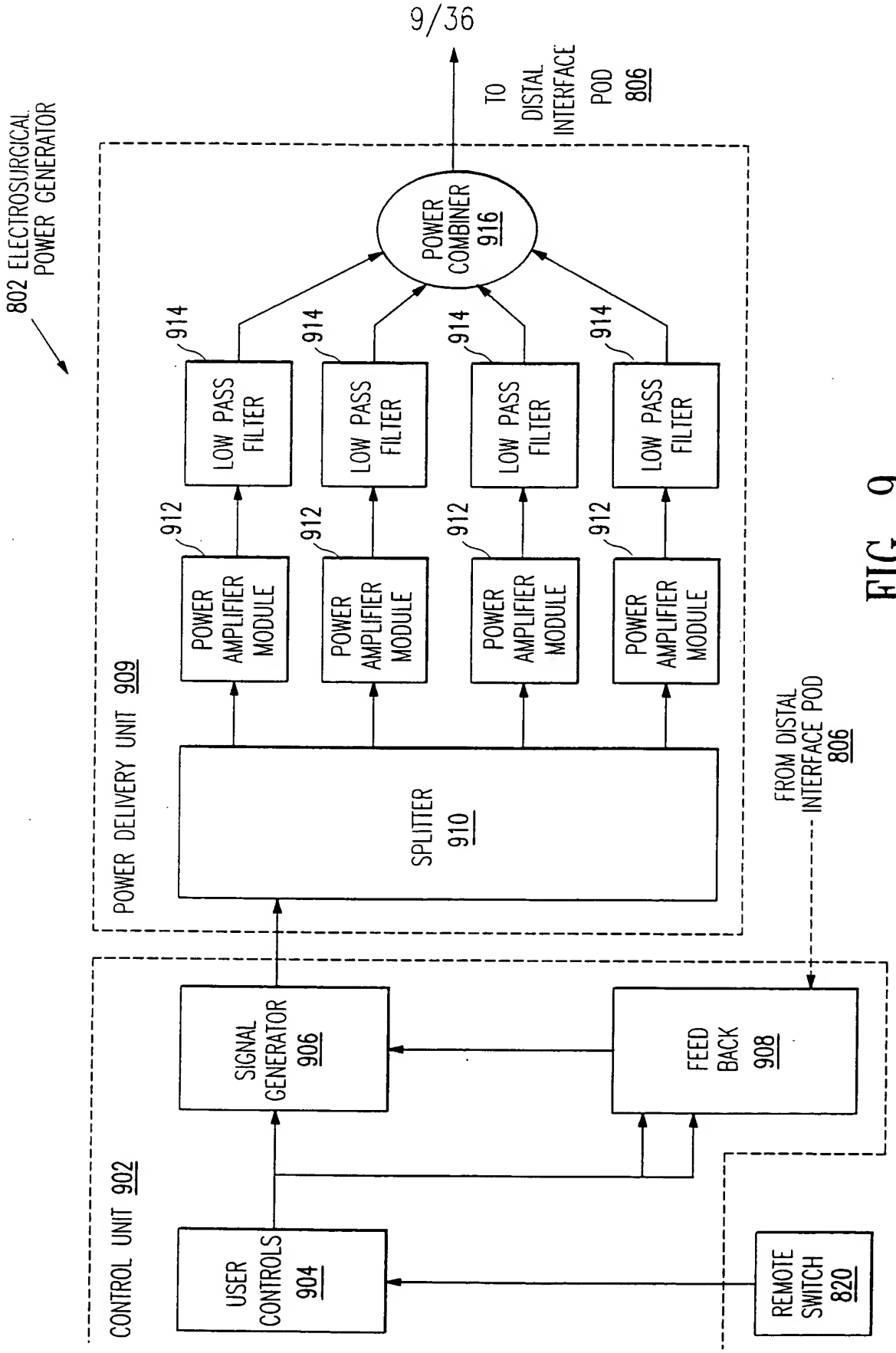

802 ELECTROSURGICAL POWER GENERATOR
TO DISTAL INTERFACE POD 806
POWER COMBINER 916
914
LOW PASS FILTER
912
POWER AMPLIFIER MODULE
POWER DELIVERY UNIT 909
SPLITTER 910
FROM DISTAL INTERFACE POD 806
CONTROL UNIT 902
SIGNAL GENERATOR 906
FEED BACK 908
USER CONTROLS 904
REMOTE SWITCH 820

FIG. 9

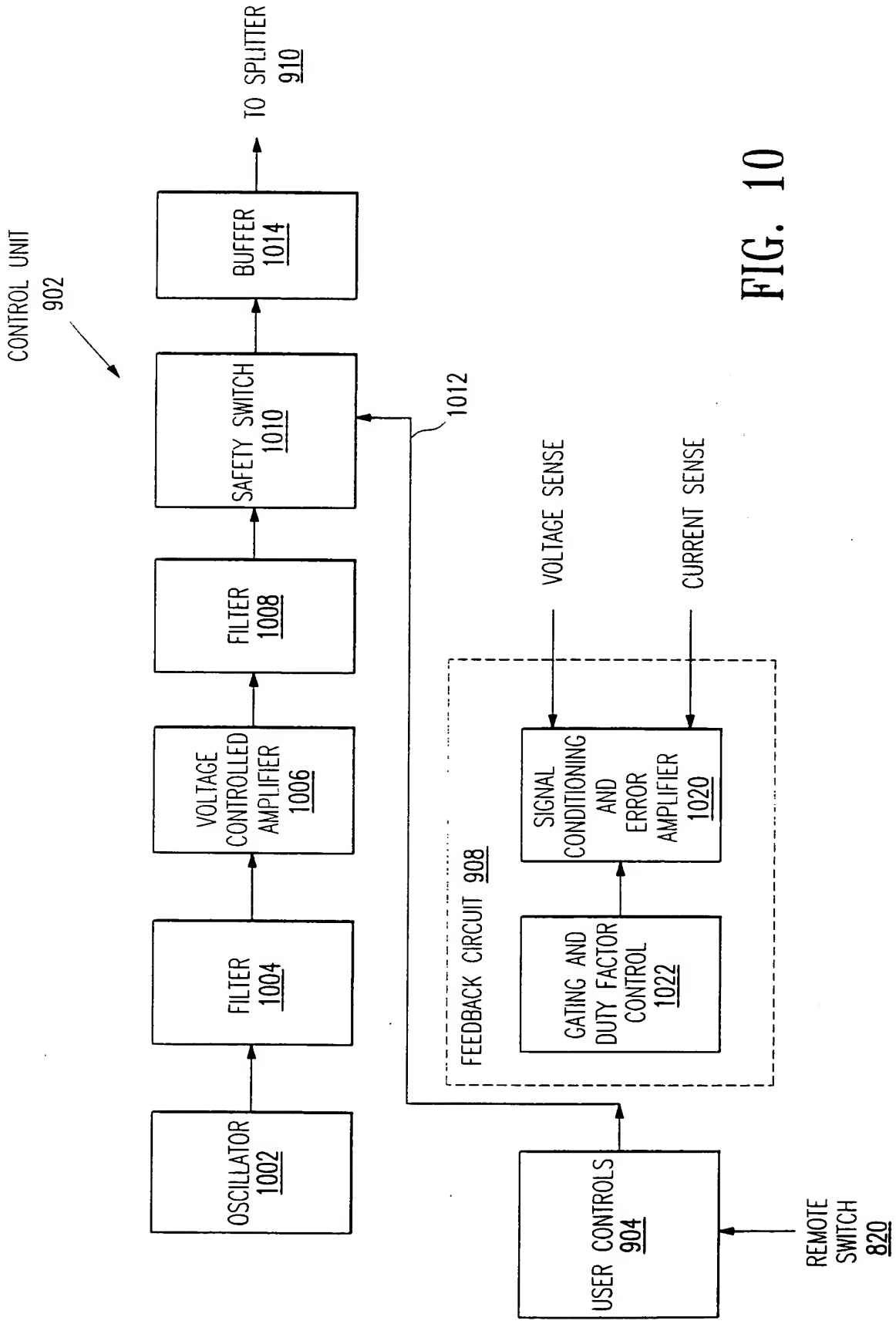

CONTROL UNIT
902
OSCILLATOR
1002
FILTER
1004
VOLTAGE CONTROLLED AMPLIFIER
1006
FILTER
1008
SAFETY SWITCH
1010
BUFFER
1014
TO SPLITTER
910
1012
FEEDBACK CIRCUIT 908
SIGNAL CONDITIONING AND ERROR AMPLIFIER
1020
GATING AND DUTY FACTOR CONTROL
1022
VOLTAGE SENSE
CURRENT SENSE
USER CONTROLS
904
REMOTE SWITCH
820

FIG. 10

FIG. 11A

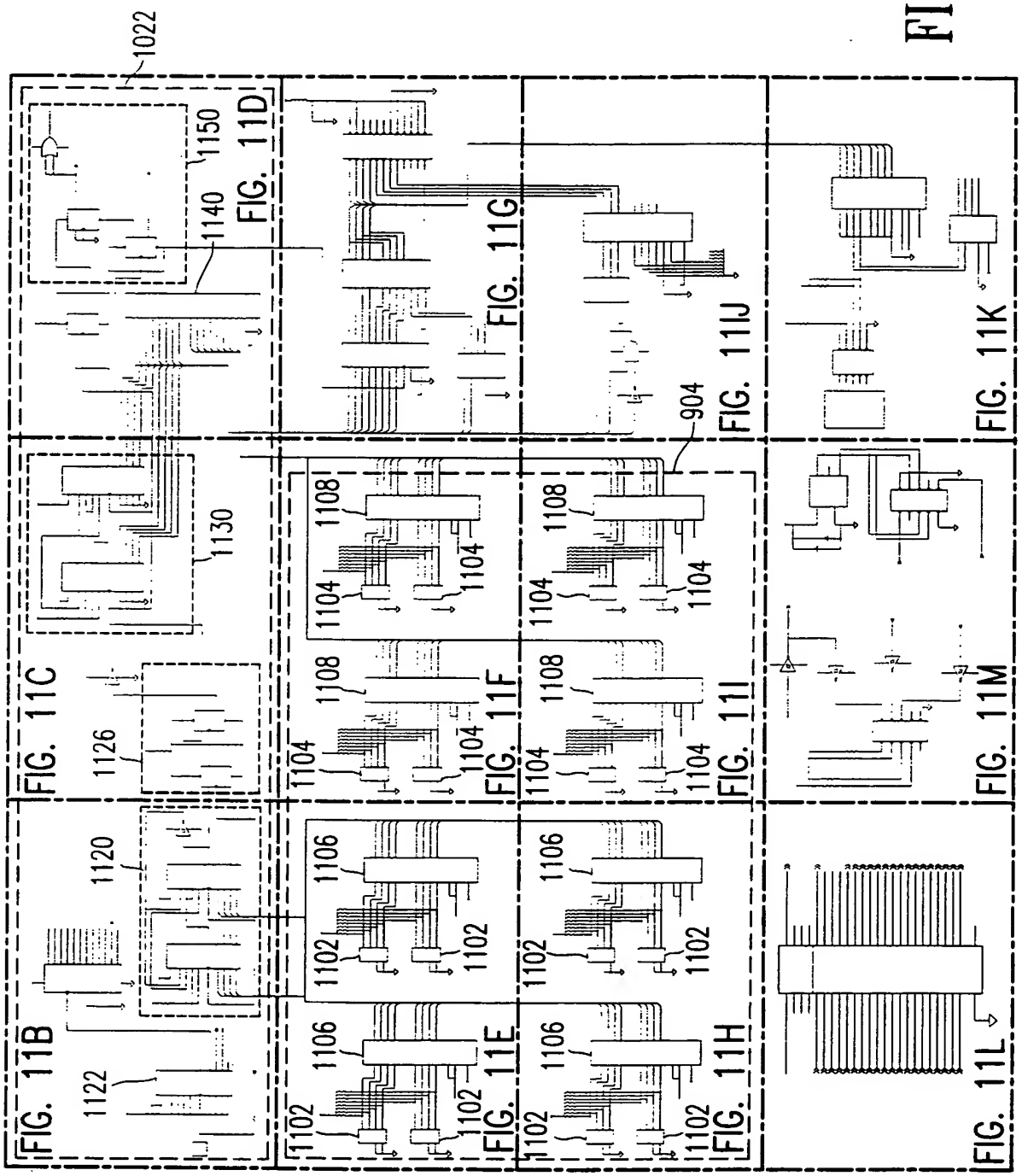

1022
1150
1140
FIG. 11D
FIG. 11G
FIG. 11J
FIG. 11K
904
1130
1108
1104
FIG. 11C
1126
FIG. 11F
FIG. 11I
FIG. 11M
1120
1106
1102
1122
FIG. 11B
FIG. 11E
FIG. 11H
FIG. 11L

FIG. 11C

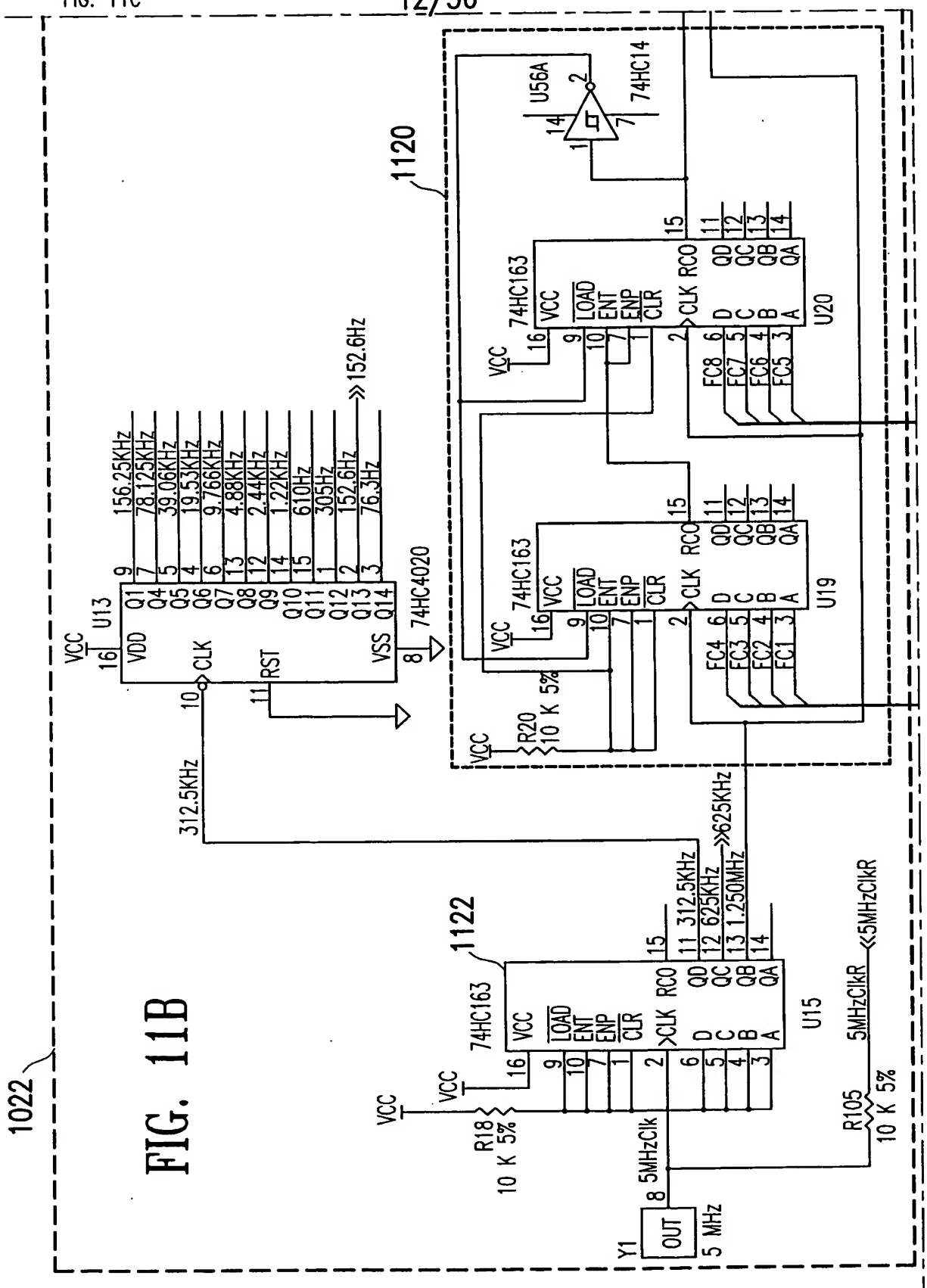


FIG. 11B

FIG. 11E

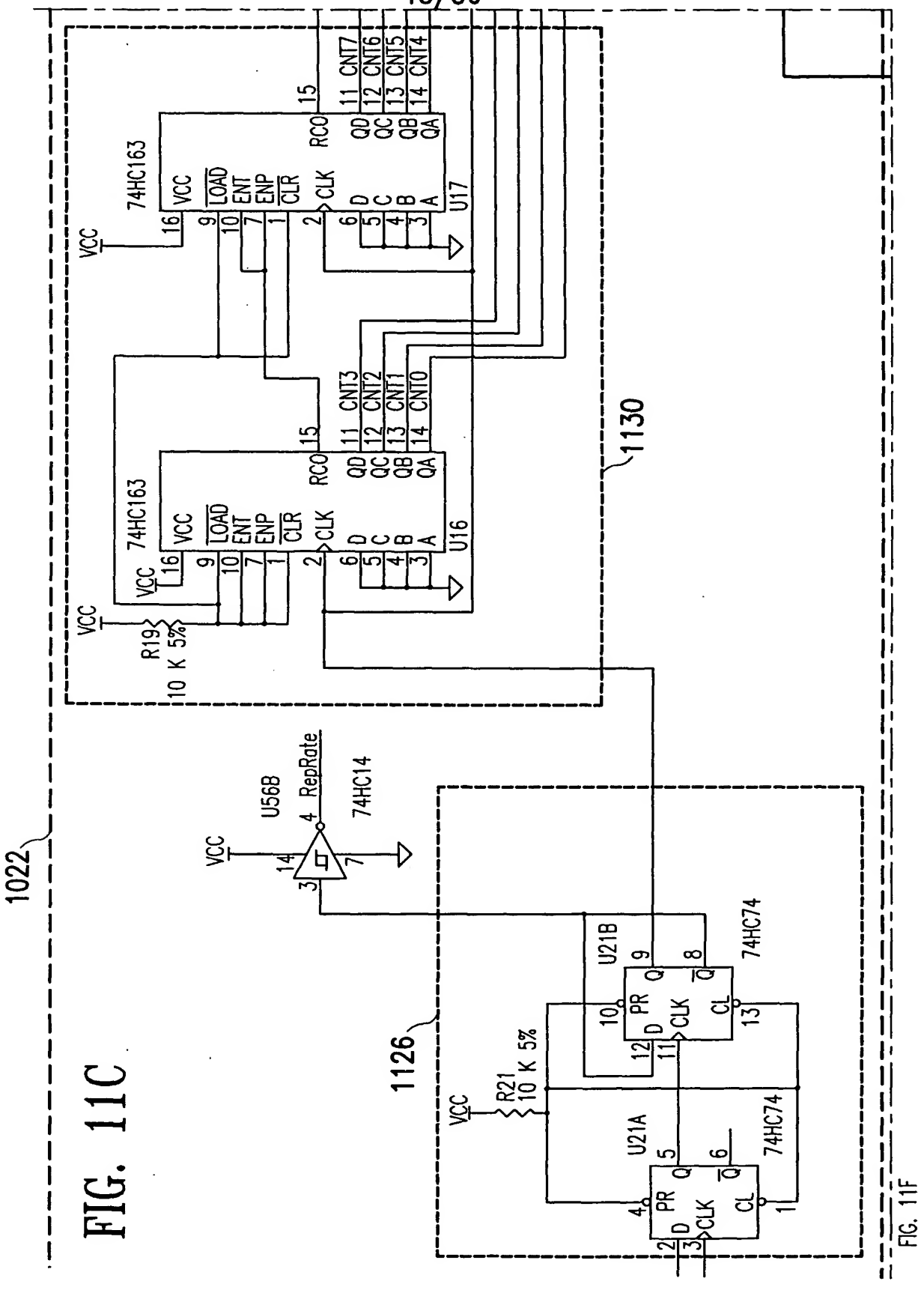


FIG. 11C

FIG. 11F

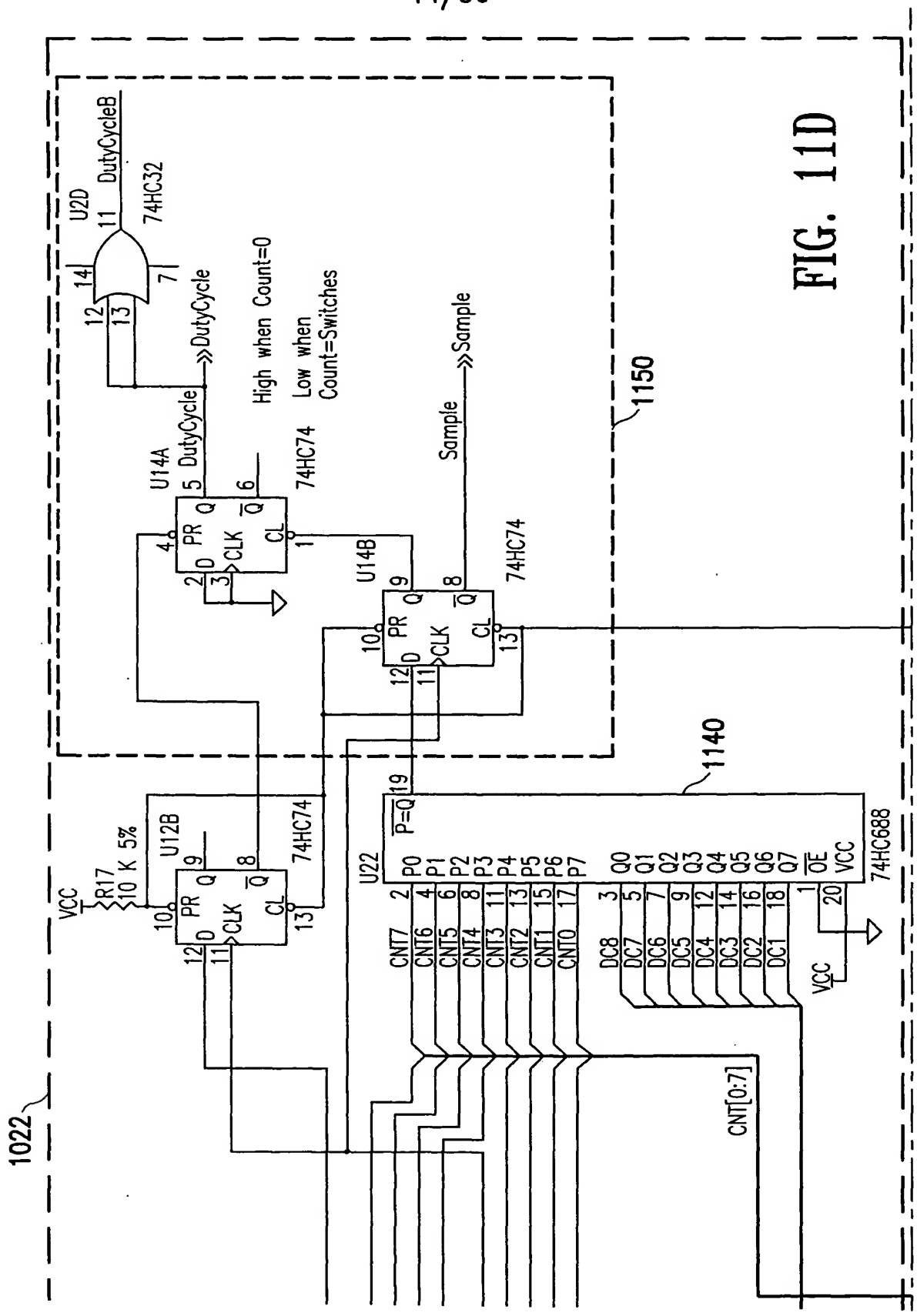


FIG. 11D

FIG. 11C

FIG. 11F

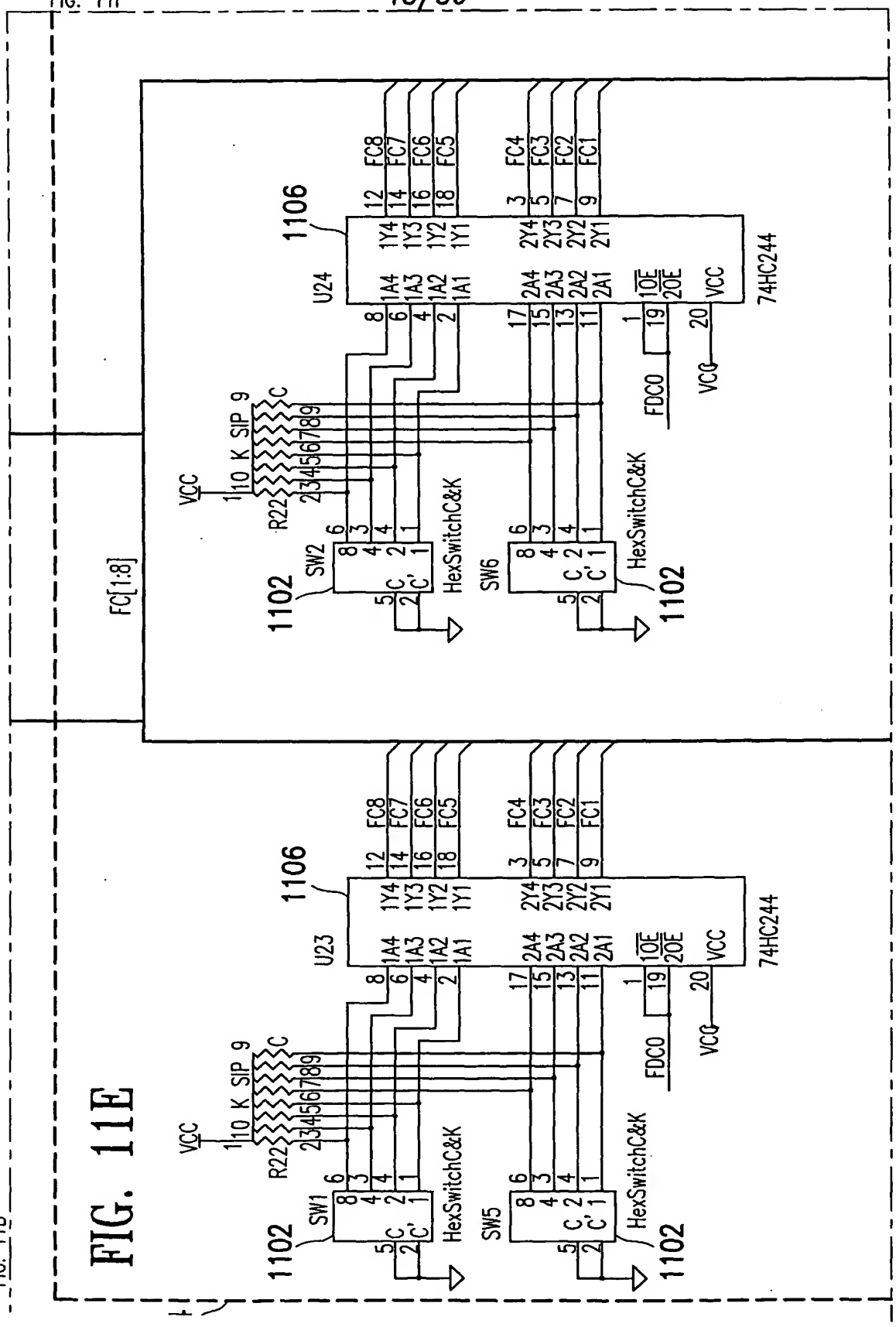


FIG. 11E

FIG. 11B

FIG. 11H

FIG. 11G

FIG. 11F

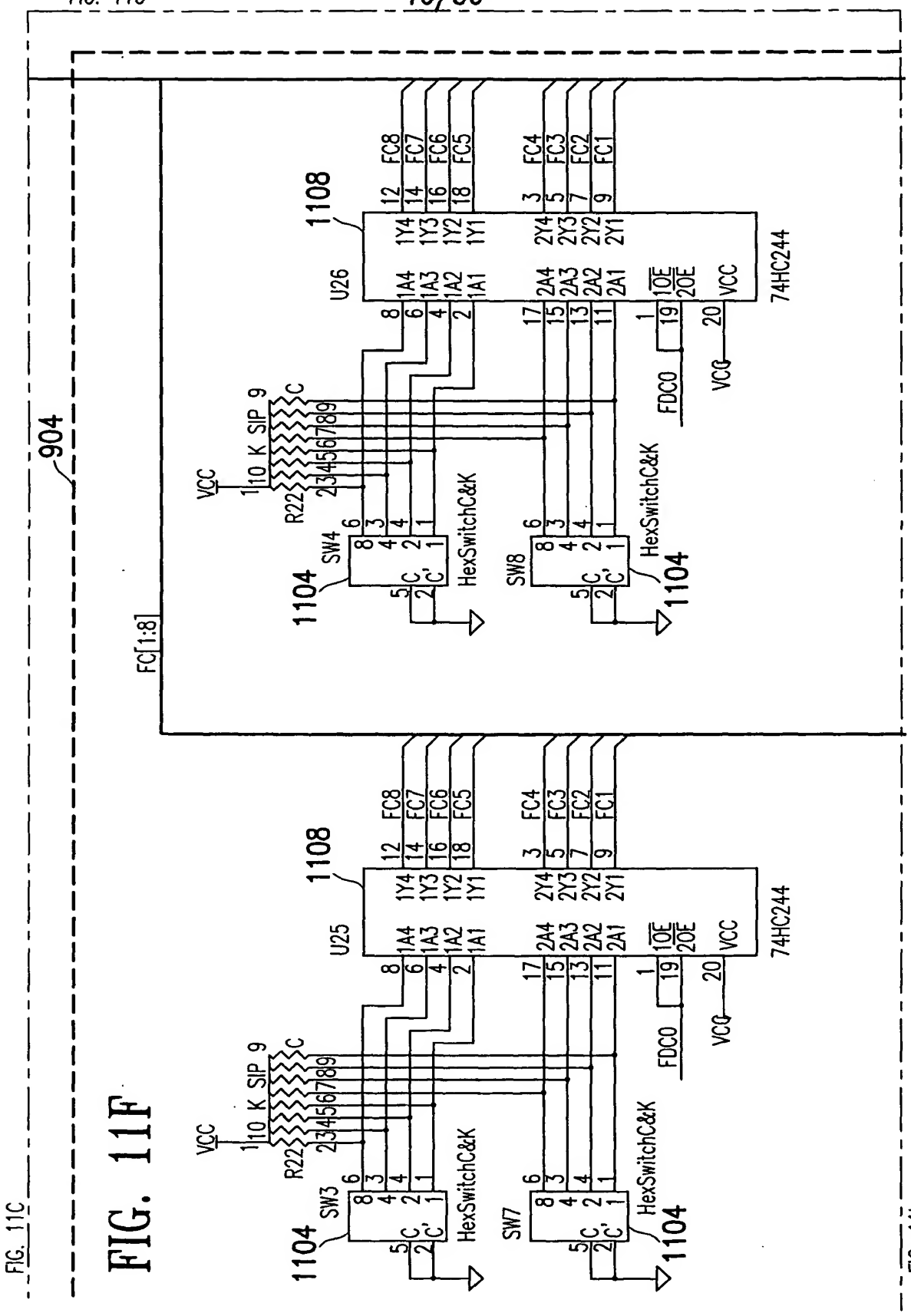


FIG. 11C

FIG. 11I

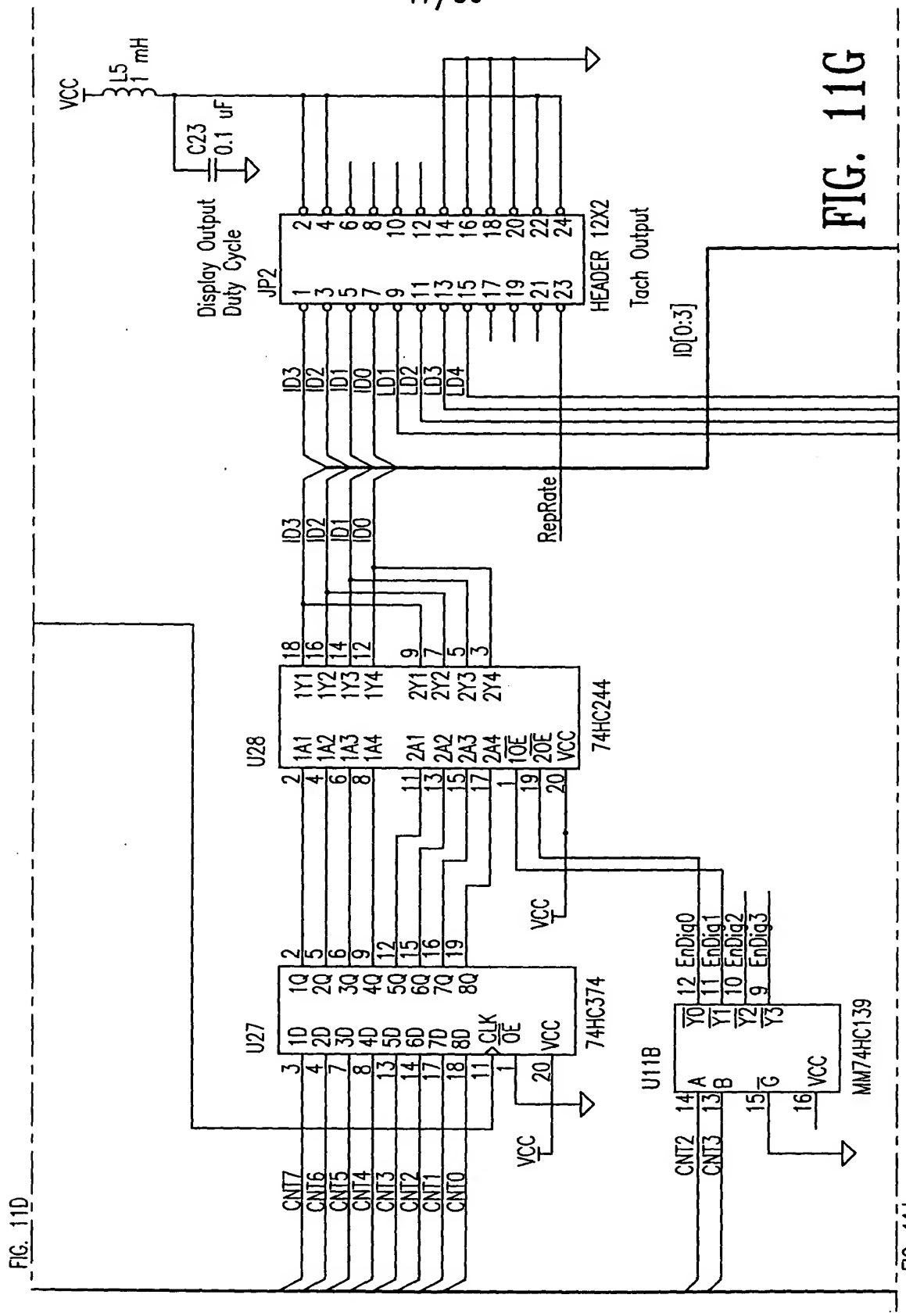

VCC
L5
1 mH
C23
0.1 uF
Display Output
Duty Cycle
JP2
HEADER 12X2
Tach Output
ID[0:3]
ID3
ID2
ID1
ID0
LD1
LD2
LD3
LD4
RepRate
U28
74HC244
1Y1
1Y2
1Y3
1Y4
2Y1
2Y2
2Y3
2Y4
1A1
1A2
1A3
1A4
2A1
2A2
2A3
2A4
1OE
2OE
VCC
U27
74HC374
1D
2D
3D
4D
5D
6D
7D
8D
1Q
2Q
3Q
4Q
5Q
6Q
7Q
8Q
CLK
OE
U11B
MM74HC139
EnDig0
EnDig1
EnDig2
EnDig3
A
B
G
CNT0
CNT1
CNT2
CNT3
CNT4
CNT5
CNT6
CNT7
FIG. 11D
FIG. 11J

FIG. 11G

FIG. 11H

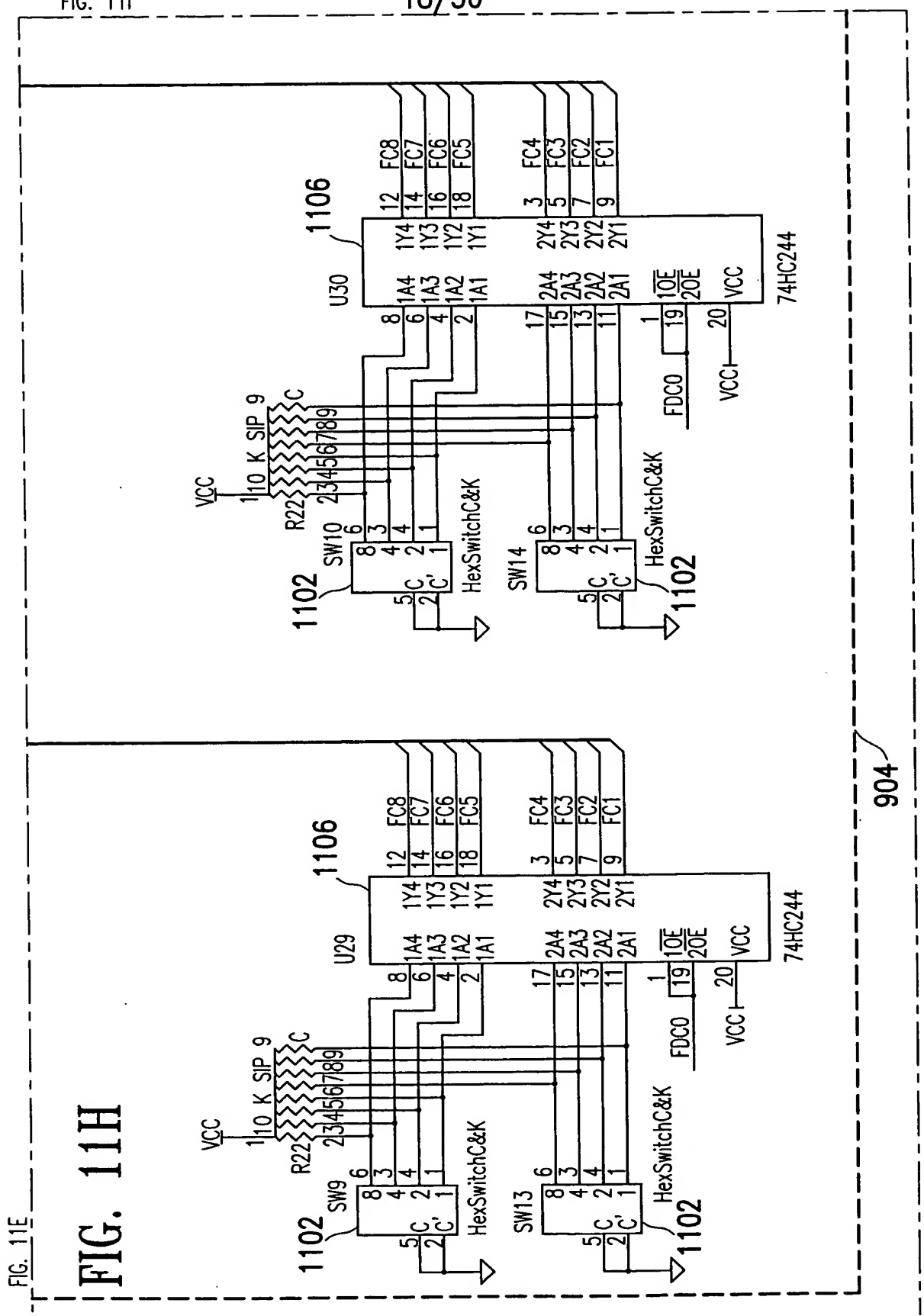

904
U29
U30
1106
74HC244
1102
SW9
SW10
SW13
SW14
HexSwitchC&K
10 K SIP 9
R22
VCC
FDC0
FC1
FC2
FC3
FC4
FC5
FC6
FC7
FC8

FIG. 11I

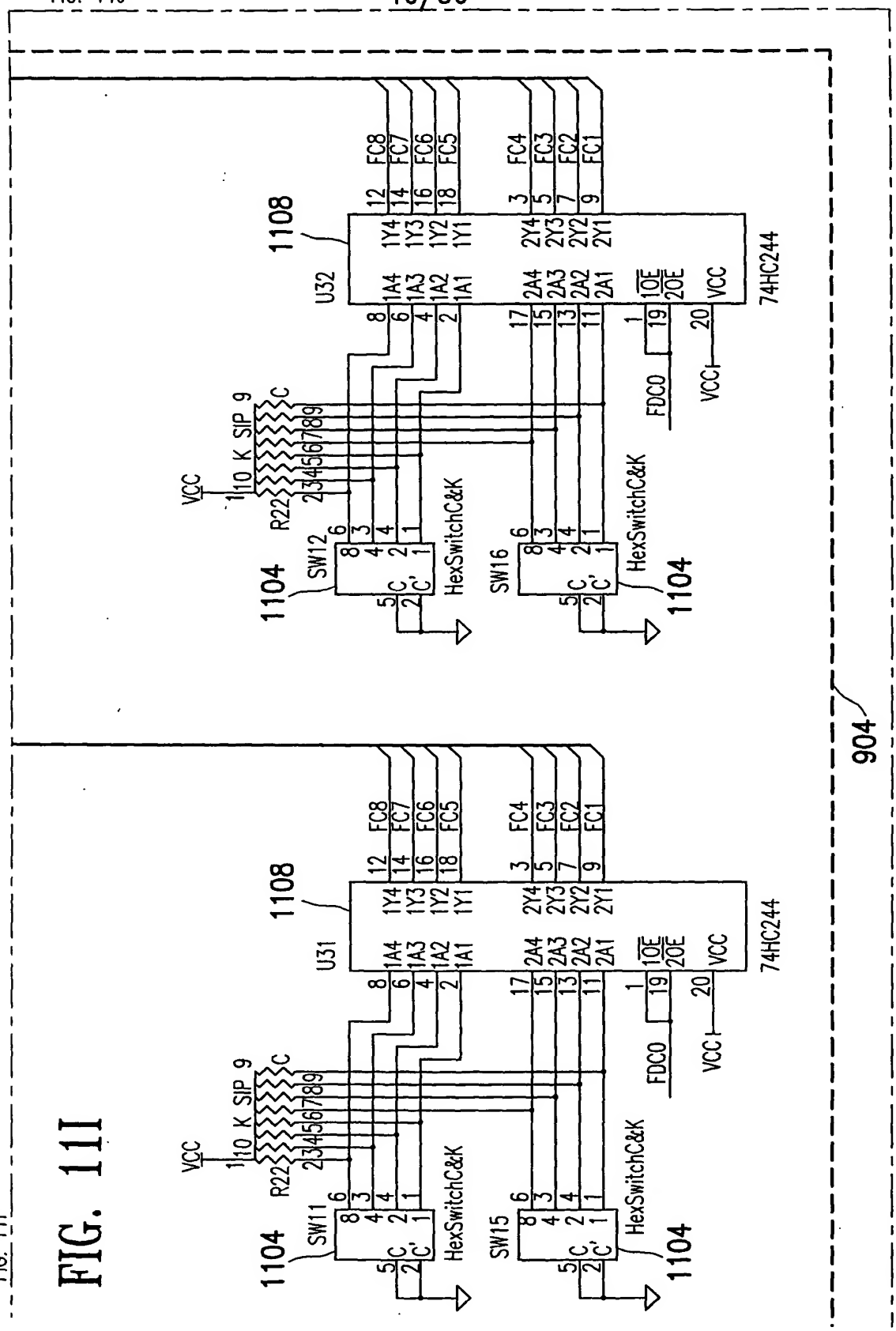


FIG. 11I

FIG. 11H

FIG. 11M

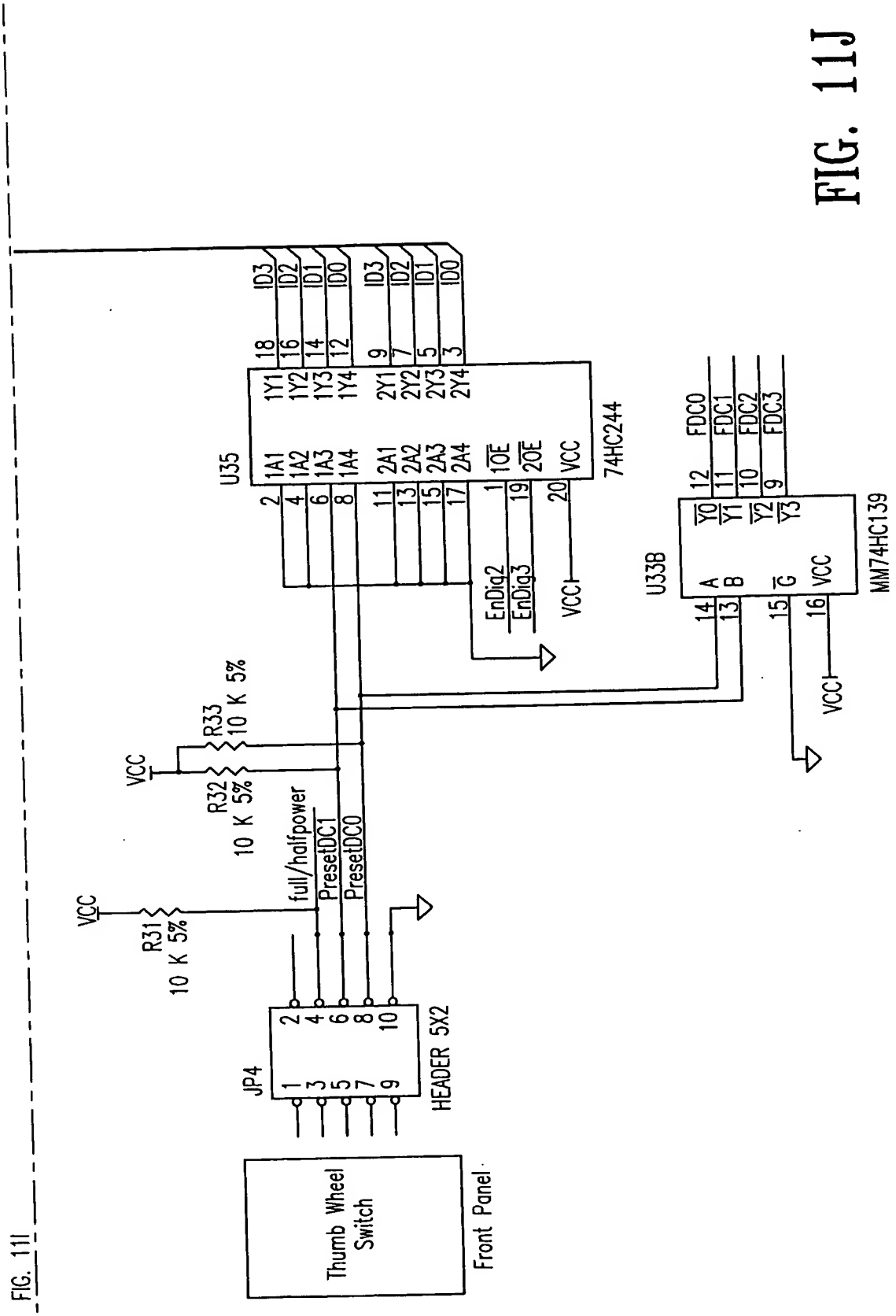


FIG. 11I
Thumb Wheel Switch
Front Panel
JP4
HEADER 5X2
R31 10 K 5%
R32 10 K 5%
R33 10 K 5%
VCC
full/halfpower
PresetDC1
PresetDC0
U35
74HC244
1A1 1A2 1A3 1A4 2A1 2A2 2A3 2A4
1OE 2OE
1Y1 1Y2 1Y3 1Y4 2Y1 2Y2 2Y3 2Y4
ID3 ID2 ID1 ID0
EnDig2
EnDig3
VCC1
U33B
MM74HC139
FDC0 FDC1 FDC2 FDC3
Y0 Y1 Y2 Y3
A B G VCC

FIG. 11J

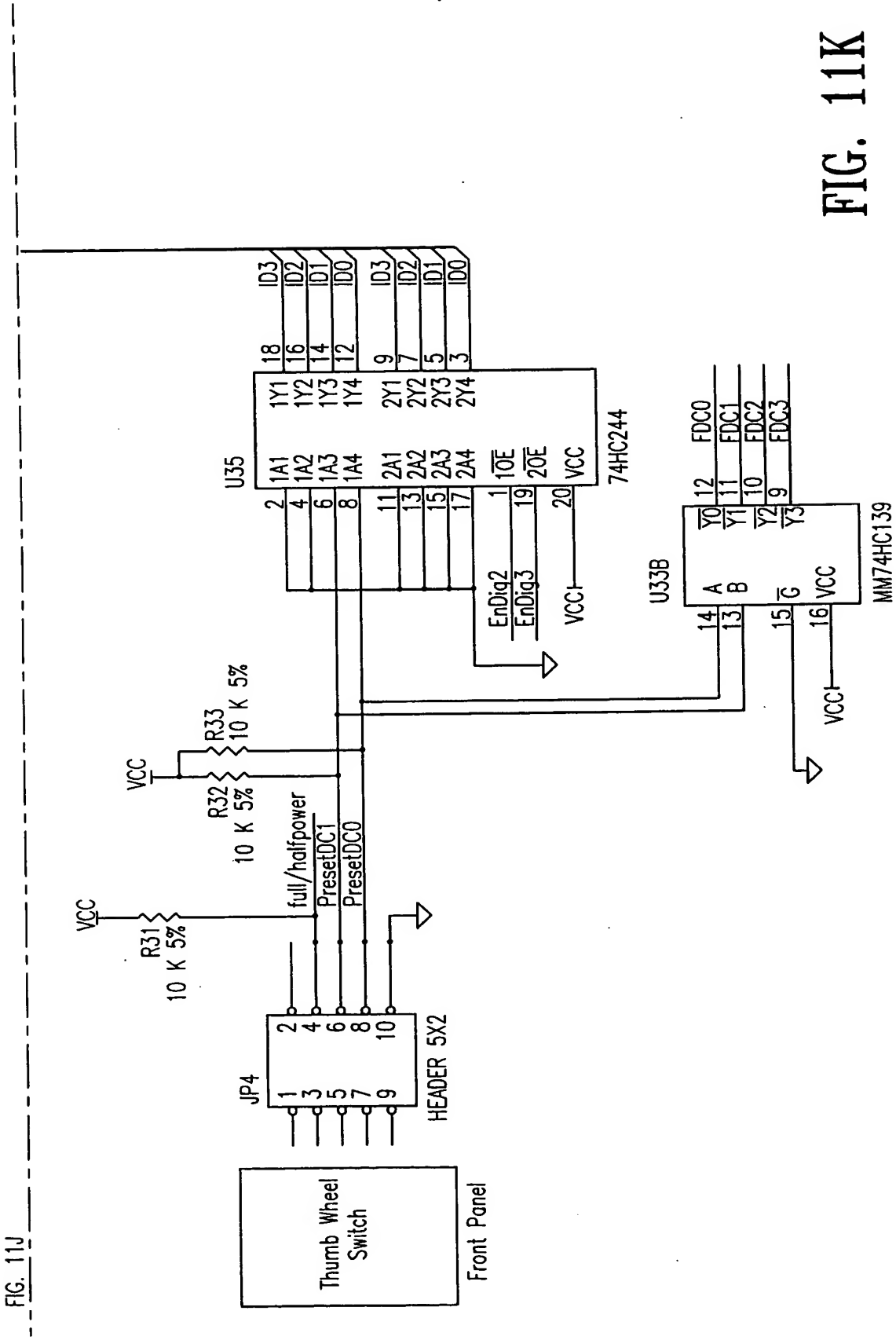


FIG. 11J
Thumb Wheel Switch
Front Panel
JP4
HEADER 5X2
R31 10 K 5%
R32 10 K 5%
R33 10 K 5%
VCC
full/halfpower
PresetDC1
PresetDC0
U35
74HC244
ID3
ID2
ID1
ID0
EnDig2
EnDig3
VCC1
U33B
MM74HC139
FDC0
FDC1
FDC2
FDC3

FIG. 11K

FIG. 11M

FIG. 11L

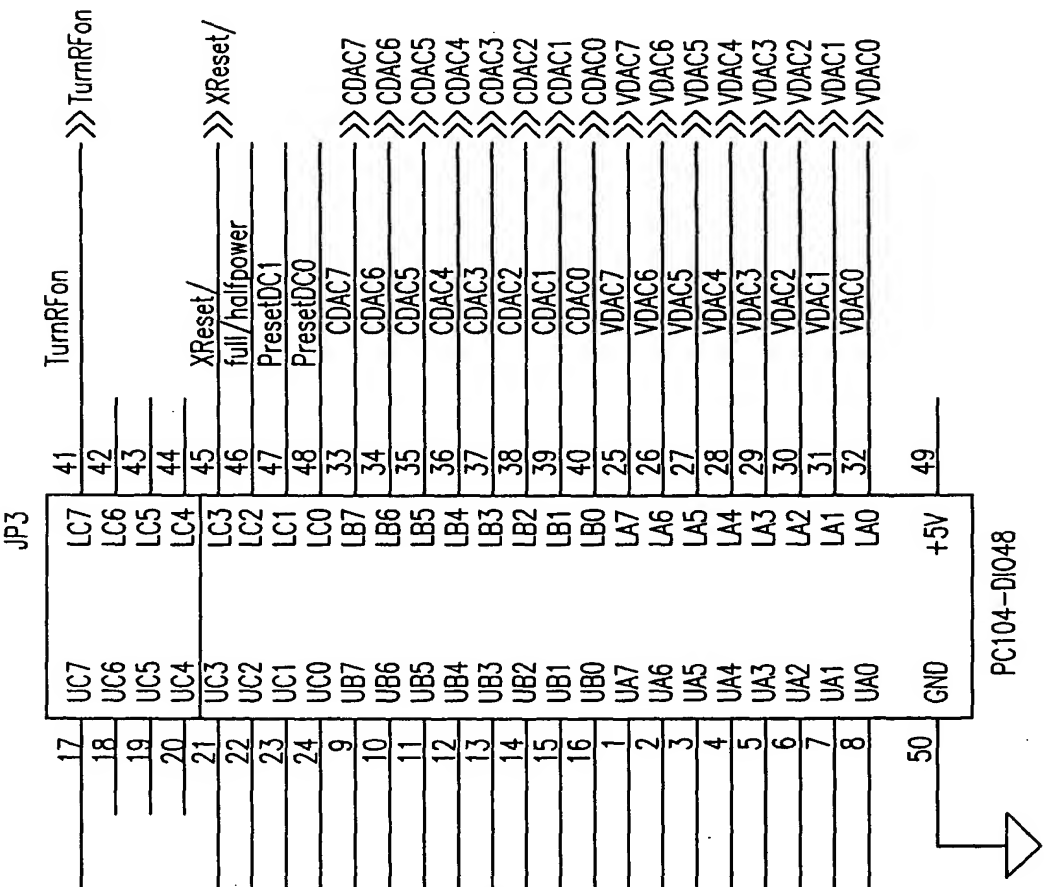


FIG. 11H

FIG. 11K

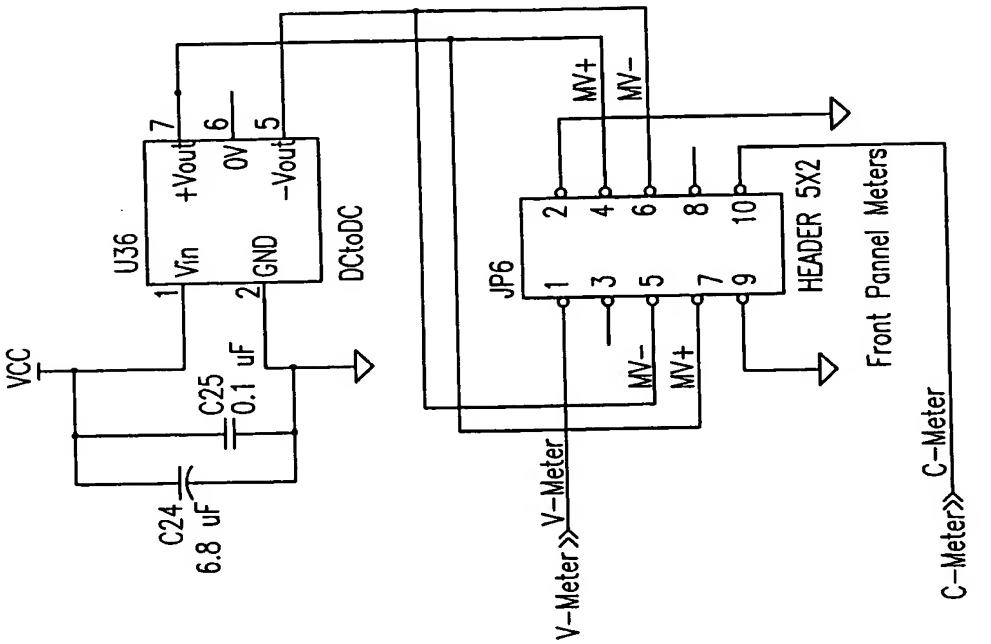
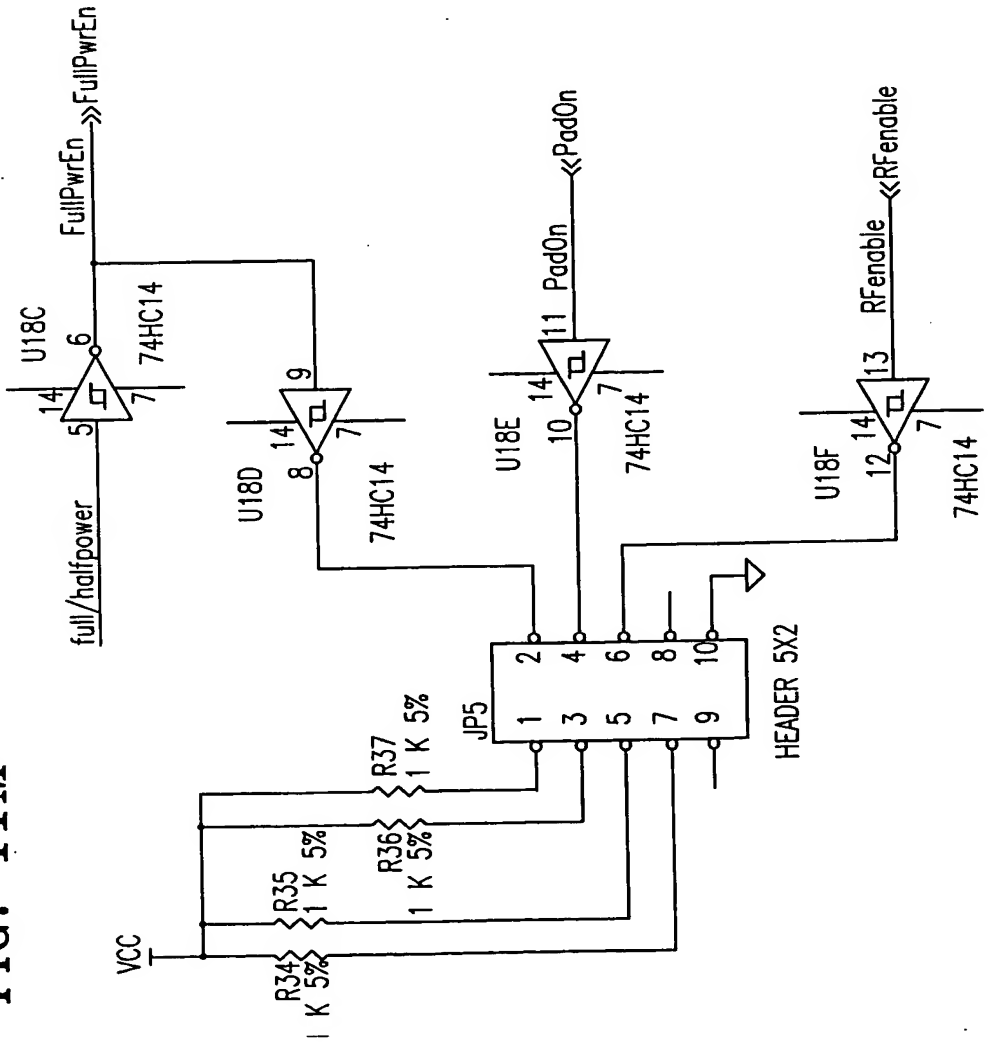


FIG. 11L

FIG. 11M



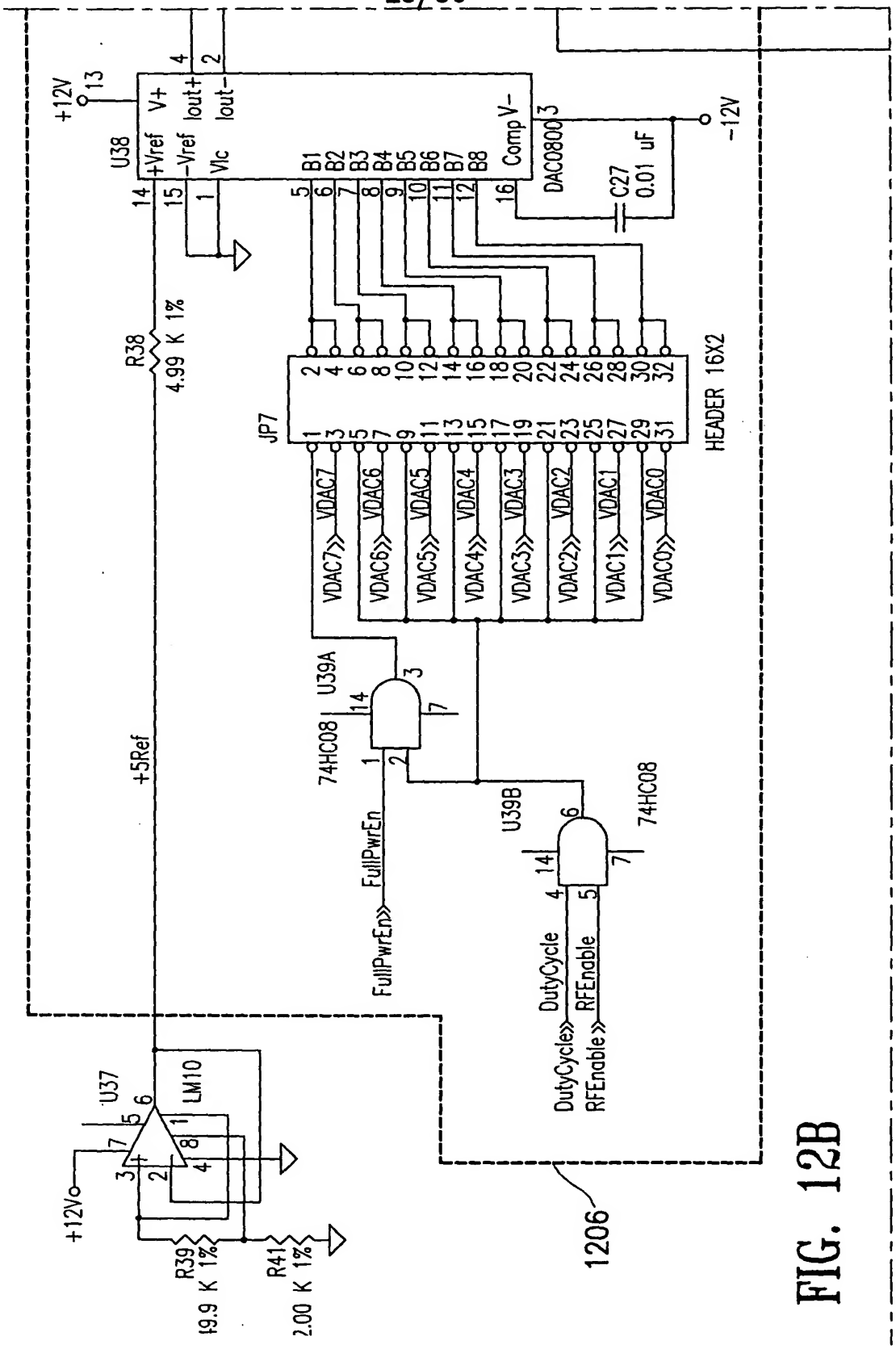


FIG. 12B

FIG. 12D

FIG. 12I

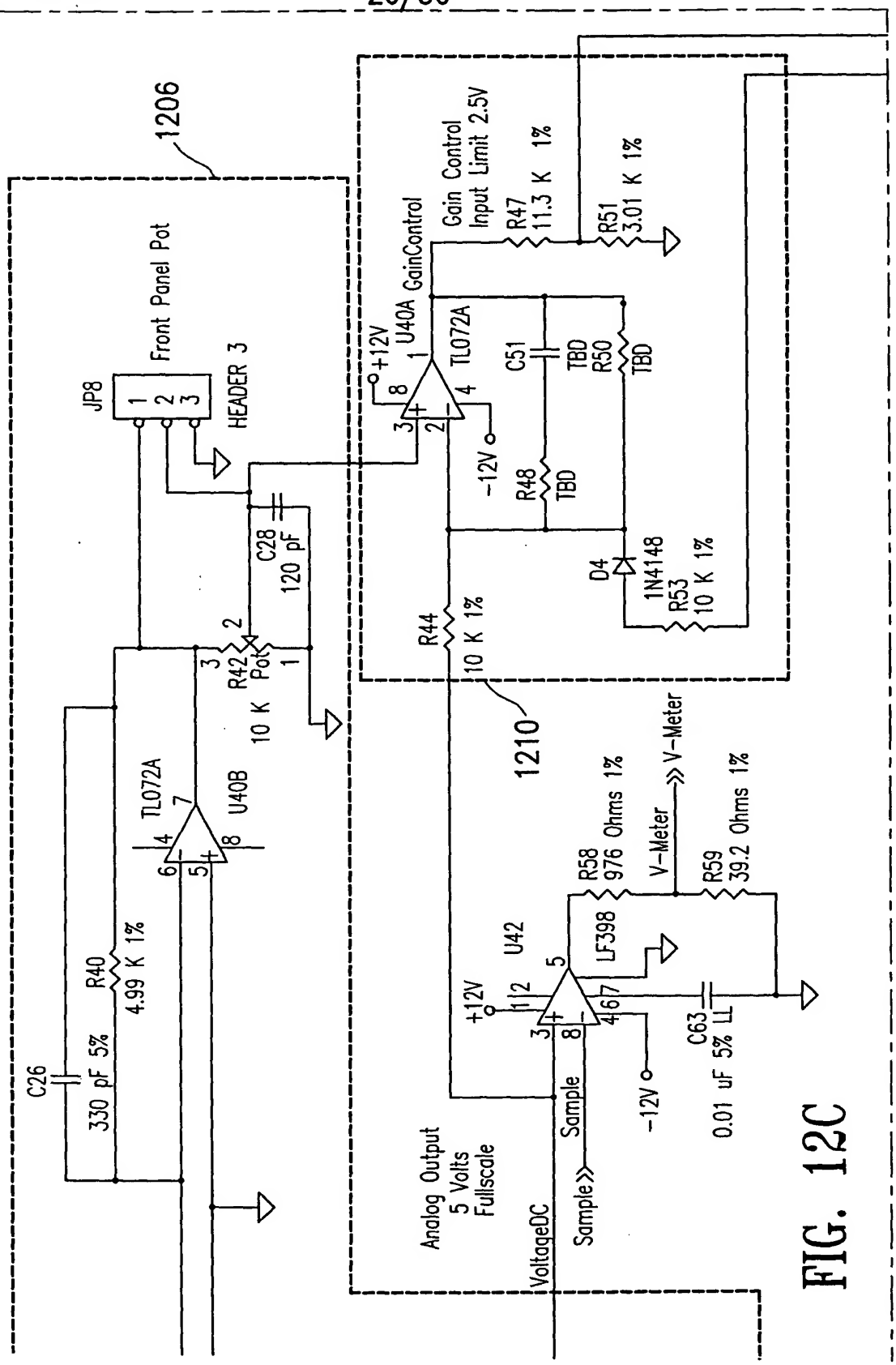


FIG. 12C

FIG. 12E

FIG.12E

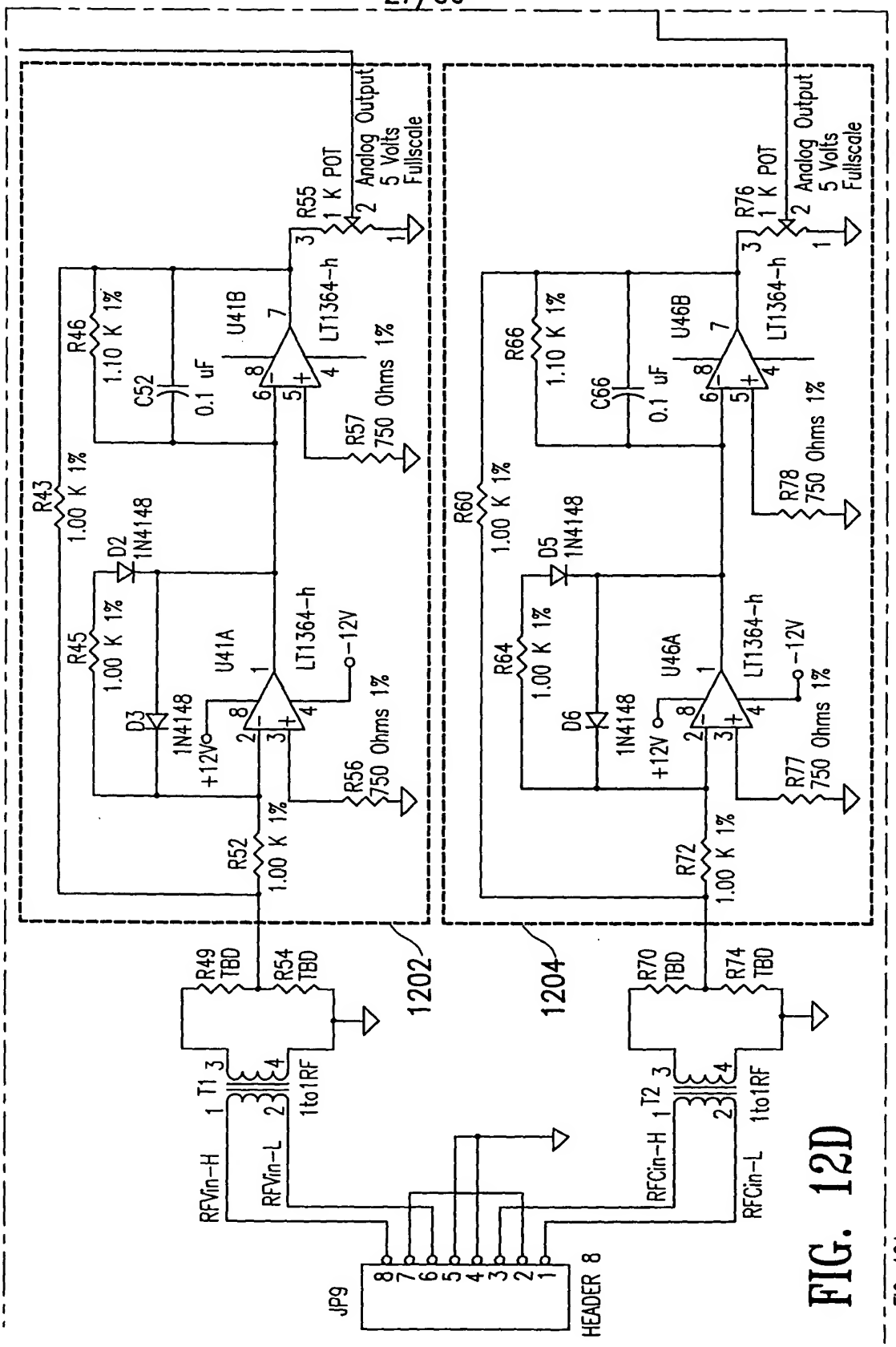


FIG. 12D

FIG. 12B

FIG. 12J

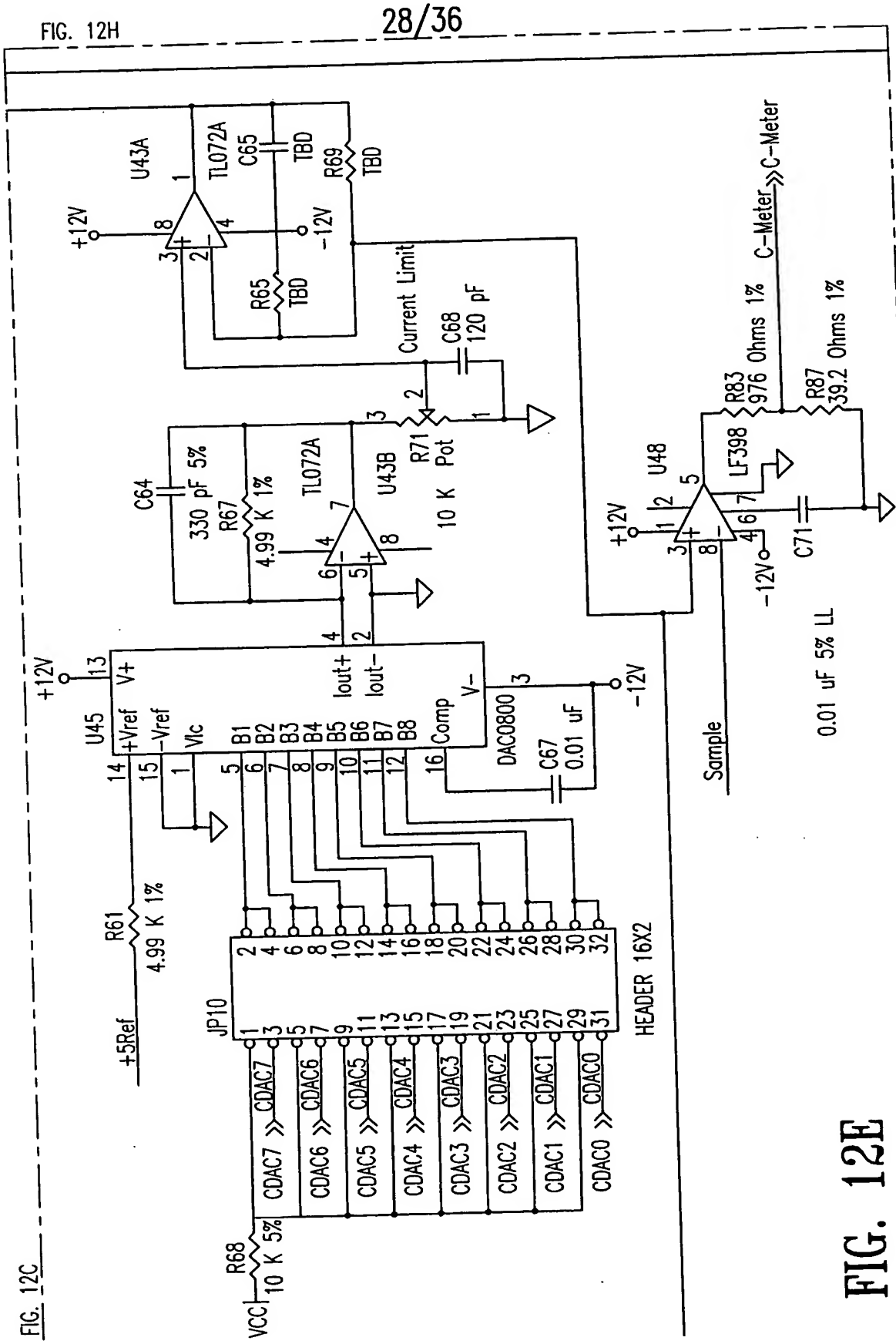


FIG. 12H
FIG. 12C
FIG. 12F
U43A
TL072A
C65
TBD
R69
TBD
+12V
-12V
R65
TBD
Current Limit
C68
120 pF
C64
330 pF 5%
R67
4.99 K 1%
TL072A
U43B
R71
Pot
10 K
U45
+Vref
-Vref
Vlc
V+
Iout+
Iout-
Comp
V-
B1
B2
B3
B4
B5
B6
B7
B8
DAC0800
C67
0.01 uF
R61
4.99 K 1%
+5Ref
JP10
HEADER 16X2
CDAC7
CDAC6
CDAC5
CDAC4
CDAC3
CDAC2
CDAC1
CDAC0
R68
10 K 5%
VCC
U48
LF398
R83
976 Ohms 1%
R87
39.2 Ohms 1%
C-Meter
C71
0.01 uF 5% LL
Sample

FIG. 12E

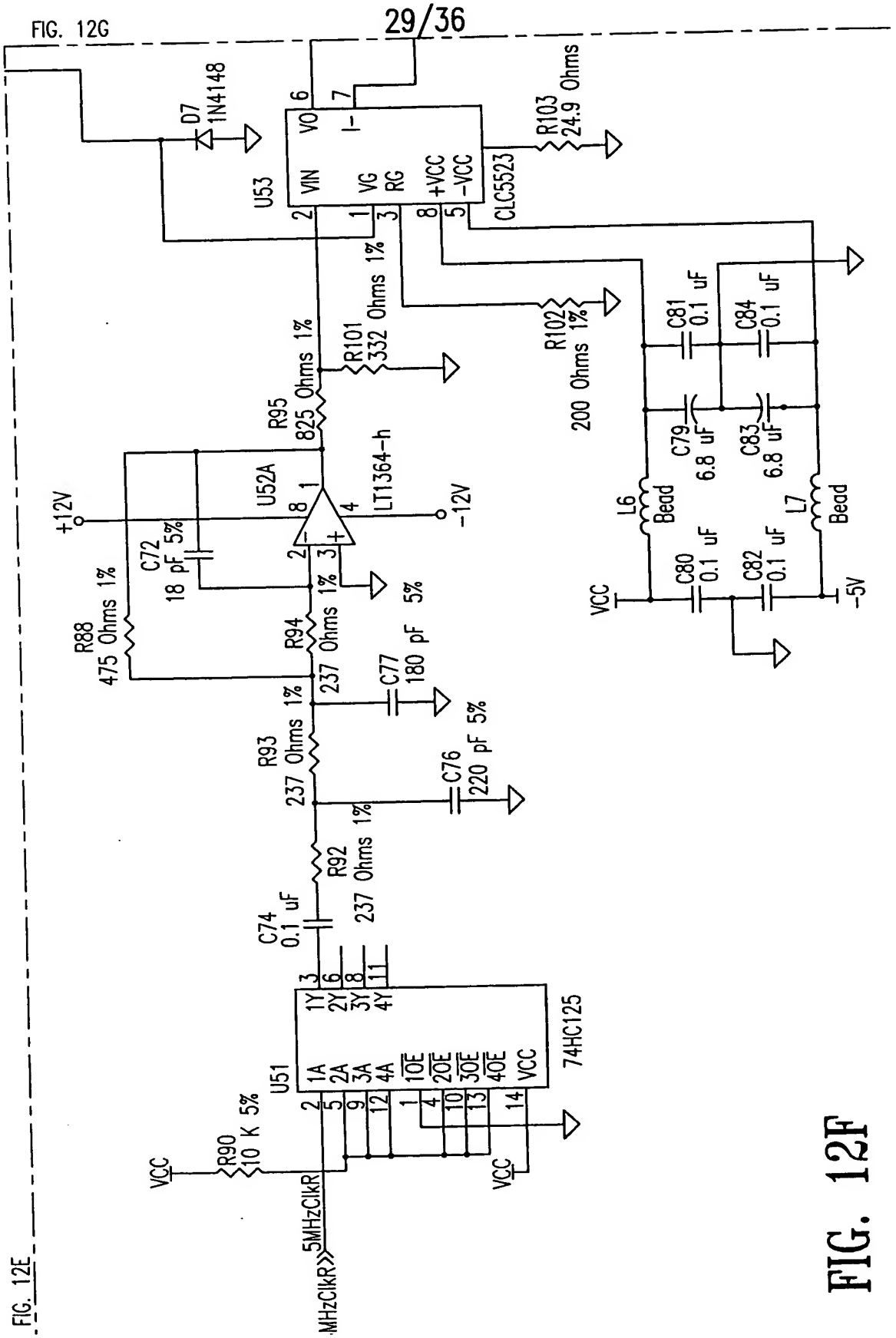


FIG. 12G
FIG. 12E
D7
1N4148
U53
VO
I-
VIN
VG
RG
+VCC
-VCC
CLC5523
R103
24.9 Ohms
R101
332 Ohms 1%
R102
200 Ohms 1%
R95
825 Ohms 1%
U52A
LT1364-h
+12V
-12V
C72
18 pF 5%
R88
475 Ohms 1%
R94
237 Ohms 1%
C77
180 pF 5%
R93
237 Ohms 1%
C76
220 pF 5%
R92
237 Ohms 1%
C74
0.1 uF
C81
0.1 uF
C84
0.1 uF
C79
6.8 uF
C83
6.8 uF
L6
Bead
L7
Bead
C80
0.1 uF
C82
0.1 uF
VCC
-5V
U51
74HC125
1A
2A
3A
4A
1OE
2OE
3OE
4OE
1Y
2Y
3Y
4Y
R90
10 K 5%
5MHzClkR
MHzClkR

FIG. 12F

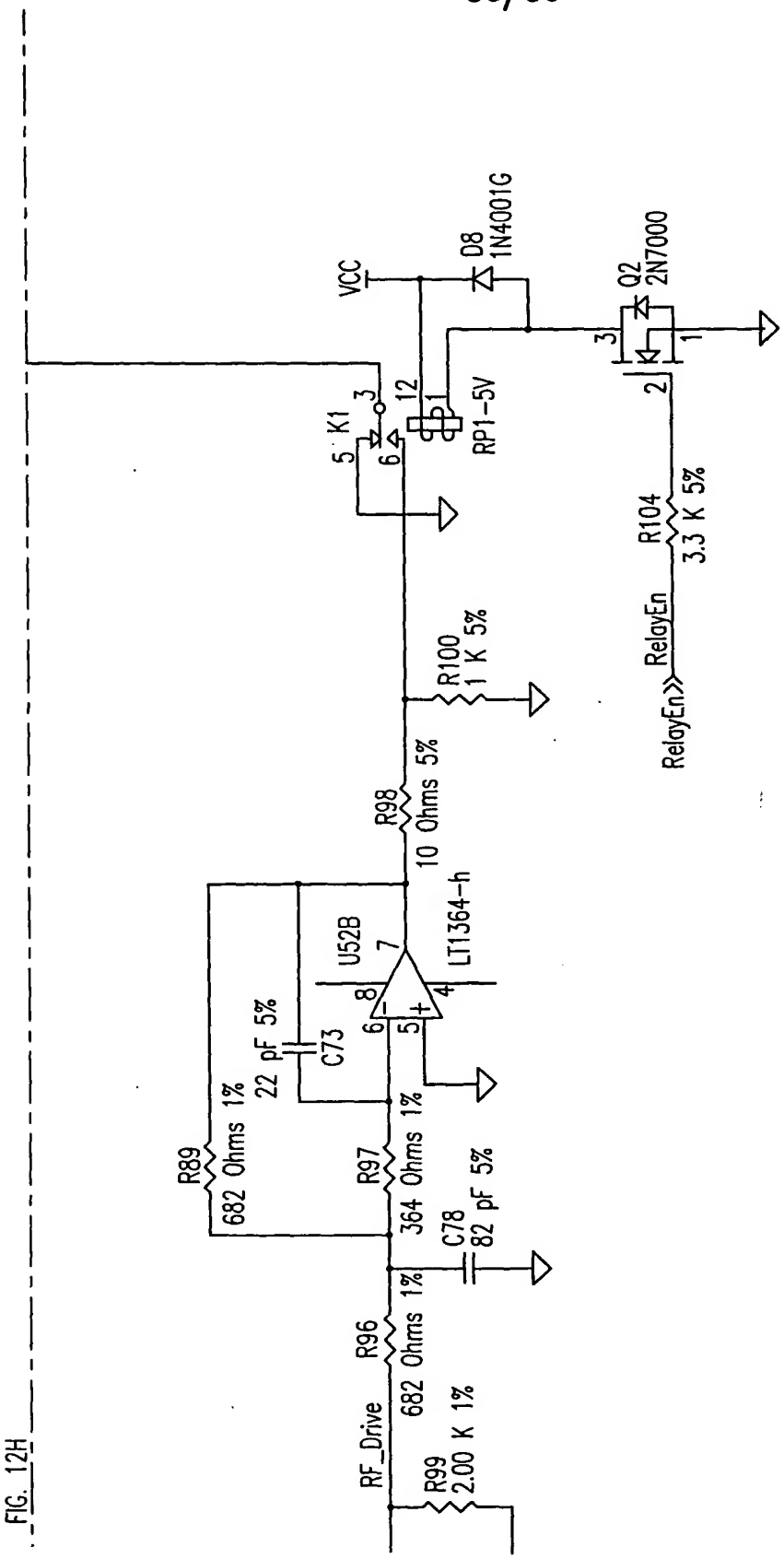


FIG. 12H

FIG. 12G

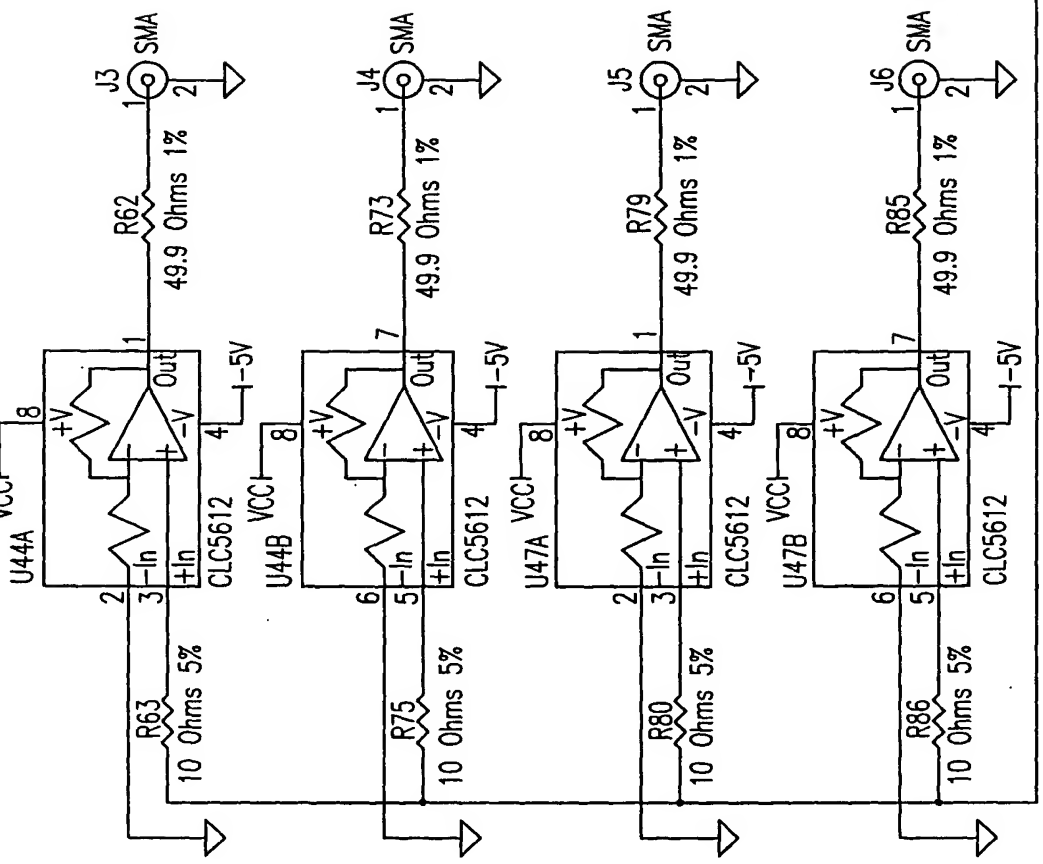


FIG. 12H

FIG. 12I

FIG. 12G

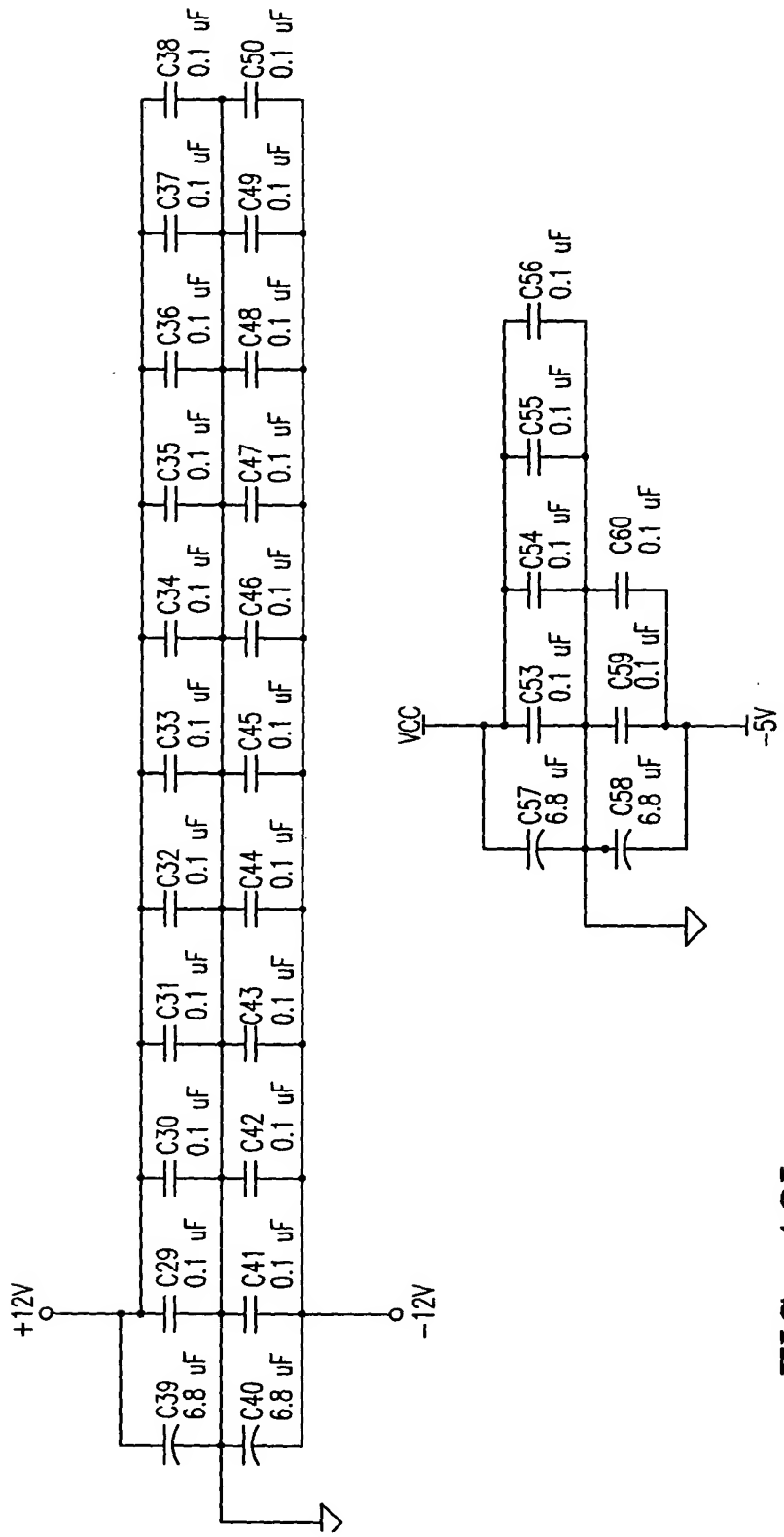


FIG. 12I

FIG. 12H

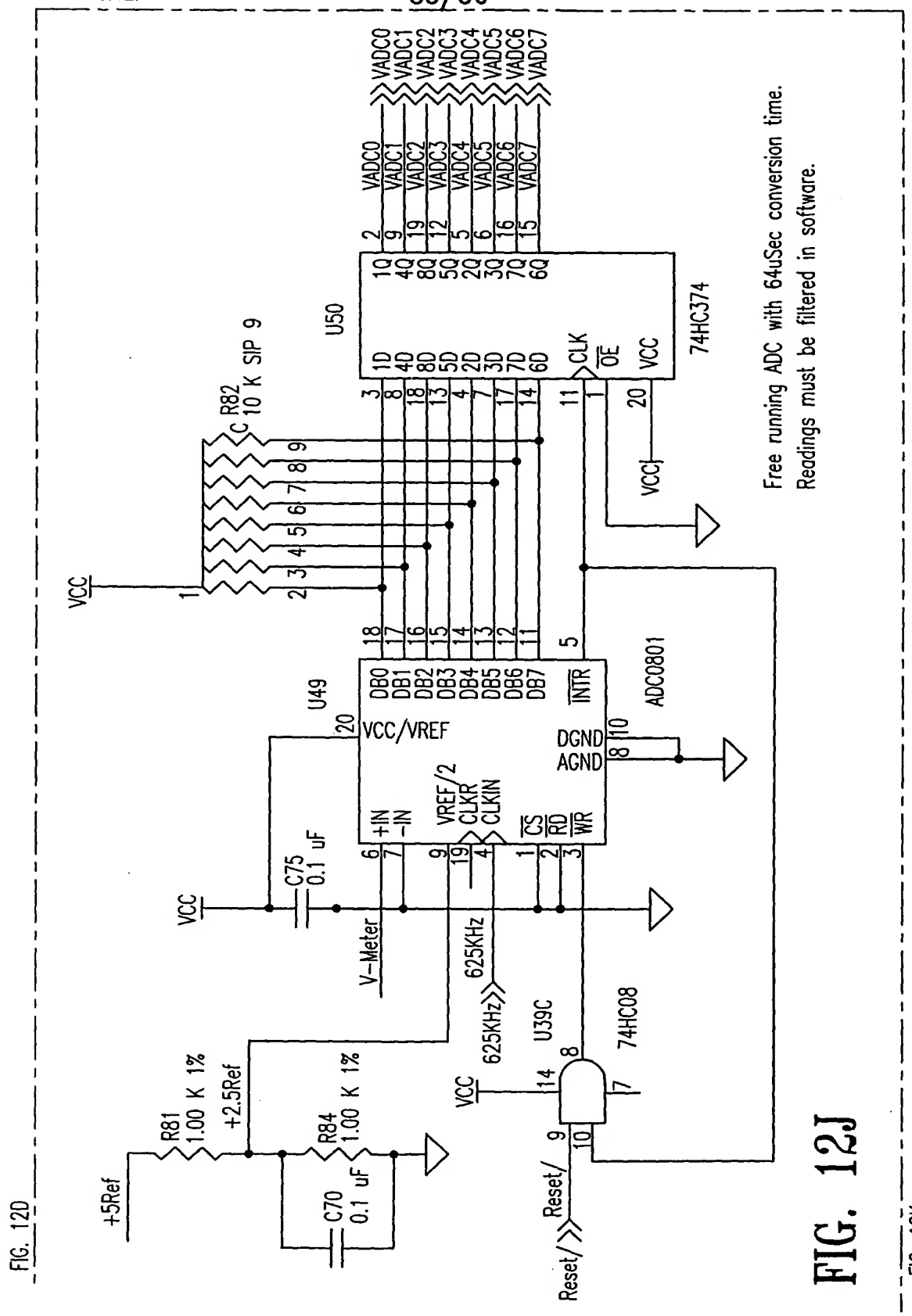


FIG. 12J

FIG. 12D

FIG. 12K

FIG. 12J

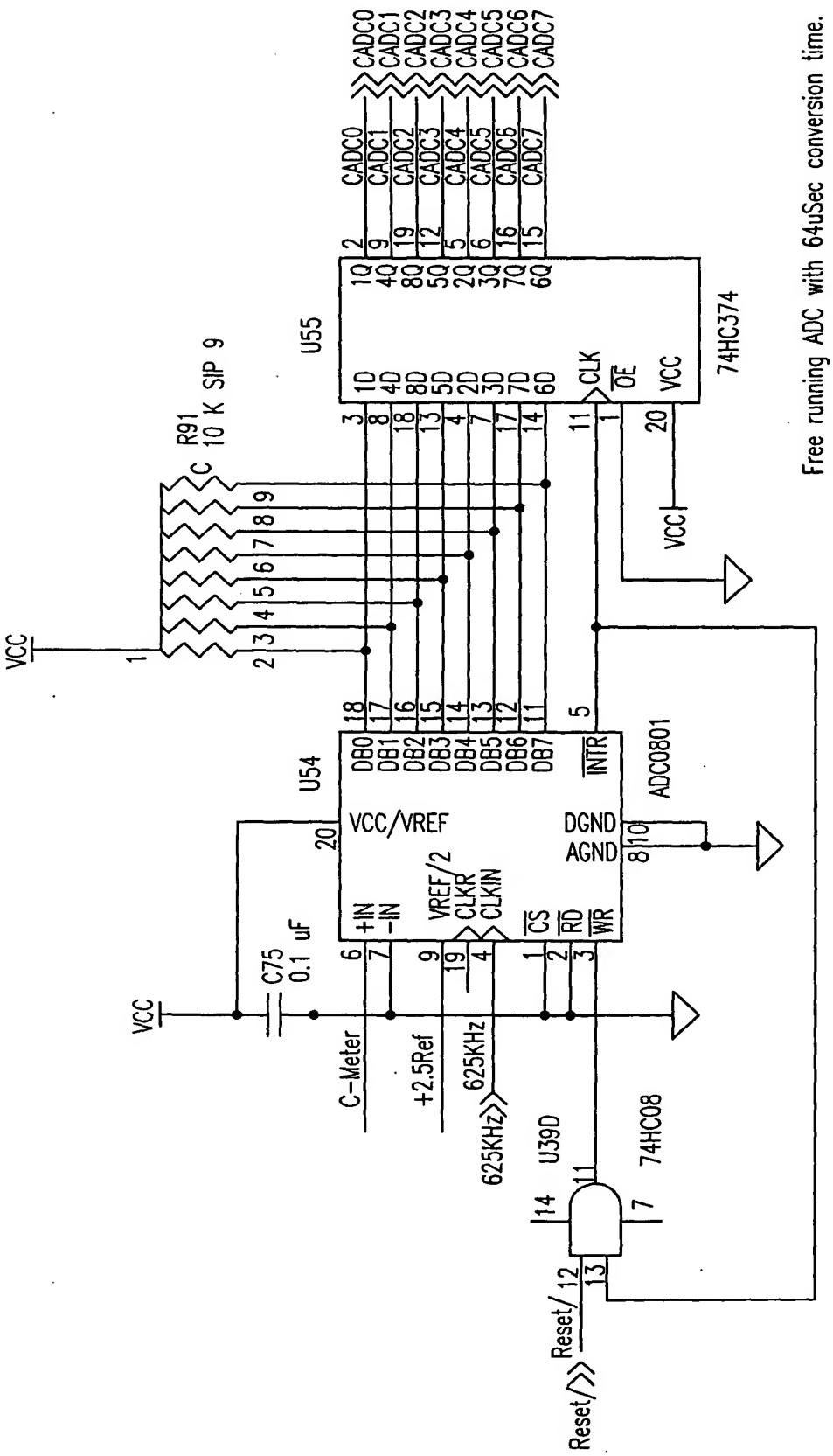


FIG. 12K